NEW-YORK FARMER,

AND

AMERICAN GARDENER'S MAGAZINE.

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D. K. MINOR, and GEO. C. SCHAEFFER, } EDITORS AND PROPRIETORS. FOR APRIL, 1837. NEW SERIES—VOL. V.

NEW-YORK FARMER.

APRIL 1, 1837.

AGRICULTURAL PAPERS.

THE Publisher of the GENESEE FARMER, grateful for the patronage hitherto extended to his Agricultural papers, would give notice that a new volume (the 7th) of

The Genesee Farmer will commence on the 1st of January, 1837. It will be enlarged and otherwise improved, and no exertions spared to sustain the high rank it has attained. It is published every Saturday, in quarto form, making an annual volume of 416 pages, at $2 a year, payable in advance.

The 2d volume of the Monthly Genesee Farmer also commences on the first of January. It is published on the first of each month, 16 pages large octavo, at 50 cents a year—Seven copies for $3—Twelve for $5, always in advance. All letters to come free of postage.

Postmasters, and others, in all sections of the country, are respectfully invited to act as agents to procure subscribers for these papers.

MORUS MULTICAULIS SEED.

THE undersigned offers for sale the Seed of the genuine Morus Multicaulis, imported direct from France, by Smith & Sons, New-York, warranted to be the growth of 1836. Said Seed is in half ounce papers, and will be sent per mail, free of charge, to any part of the United States, on the receipt of $3 for one or $5 for two papers. Notes of all solvent banks received in payment. This seed is warranted to produce the genuine Chinese variety, and the money in all cases will be refunded on satisfactory proof to the contrary. Short directions furnished to each order for cultivating.

SETH WHALEN, P. Master.
Whalen's Store, N. Y. 4—3

PRESERVE YOUR RECEIPTS, *especially* for newspapers, and periodicals, as such accounts are more numerous than in most other kinds of business and therefore errors are more like to occur. To avoid errors in our accounts, and to give the parties interested an early opportunity to correct them should they occur, we have adopted the plan of publishing in each number, the name, residence, and *date paid to*, of those who have paid during the week—and we request early information should error be detected by subscribers.

PAYMENTS IN ADVANCE.—Our friends who have so promptly paid in advance, for the current year of the Journal, will please accept our thanks. Those who have been to *busy* to think of such a *trifle*, will have the goodness to receive "*in advance*," our thanks, and then we shall have nooccaon is to repeat the expression on receiving their favors.

To those who have been so constantly engaged in *business* as to *omit* to pay for *previous* years, we will merely say—it will afford us much pleasure to receive the amount and record their names as paid to *January* 1838.

We are gratified in being again able to lay before our readers the valuable and interesting productions of the Rev. HENRY COLMAN. Mr. Colman spent much of the last season in travelling through the country, and especially at the west, and we therefore hope to be able to give much interesting information in relation to the agricultural condition and prospects of the country through which he passed.

We commenced in the March, and continue in the present number of the Farmer, a series of Sketches, by Mr. Colman, which will be found highly interesting and useful.

We also anticipate much other useful matter from the same pen.

CONSUMPTION OF A GREAT CITY.—Paris in 1822, according to Count Chalrol, consumed the following animals and articles.

931,000	Pigeons.	
1,289,000	Chickens.	
549,000	Turkeys.	
328,000	Geese.	
131,000	Patridges.	
177,000	Rabbits.	
174,000	Ducks.	
Butter and Eggs, value	10,348,800	francs.
Fish, "	3,417,600	"
Oysters, "	599,400	"

For the New-York Farmer.

No. II

GENERAL SKETCHES.

BY H. C.

Having in a former number sketched some of the general features of the Agriculture of New-England, I shall proceed to speak in a cursory manner of some other parts of the country, which I had an opportunity of imperfectly and hastily observing. Every allowance must be made for the observations of a passing traveller. He can at best give only the prominent points, which present themselves; and in regard to these, with the most honest intentions, he may convey very erroneous impressions, for his own impressions may themselves be erroneous. I dare say the experience of many a traveller will bear me out in saying that a country often appears very differently to the same individual in going or returning through it, though he may in each case travel by the same road. To a person, who judges of a country only by passing over it, a clear or a cloudy, a fair or a stormy day will often make a material difference in his judgment. His own condition, his cheerful health or his indisposition will sometimes give unconsciously a coloring to his opinions. The company in which he travels are not always without their influence upon him; the condition of the taverns, the state of the roads, and the season of the year. Then he is always liable through the ignorance, or the selfishness, or the prejudices of those whom he meets with to be imposed on by partial or false information. These considerations, and other obvious occasions of mistake in facts and opinions ought to be taken into the account before we charge a traveller either with ignorance, or misrepresentation through negligence or design. In truth no just account can be given either of the condition of a country or the character and manners of its inhabitants without a residence among them for some time; and this under circumstances peculiarly favorable to observation.

In the remarks made in my former number, it may be thought by some that I have hardly done justice to New-England. The truth is that the predominant occupations in New-England are not agricultural; manufactures and commerce prevail over others; and agriculture has become only a secondary interest. Yet notwithstanding this, I am satisfied that when the character of her soil and climate are taken into consideration; and the amount of land actually under cultivation are duly considered, the total amount of her productions will be found large in proportion; and creditable to the skill, the persevering enterprise, and the sprit of agricultural improvement prevailing among her inhabitants. Enough at least will be seen to show what might be accomplished by the

same labor, enterprise, and spirit, applied in a manner equally judicious and, as far as soil and climate are concerned, under circumstances more conspicuous.

New-York, an empire within itself, has all the elements of agricultural prosperity and improvement. She embraces a large amount of the most productive soil, with the means in profusion for preserving and increasing its fertility. She abounds even in her remote settlements with facilities of access to markets, where the demand is equal to any amount of production, which may be furnished; and with an intelligent, sharp-sighted, and active population, ready to avail themselves of any means which may be presented, for advancing the great, absorbing, overwhelming object of pursuit throughout the whole country, the attainment and increase of wealth. Her commerce, her manufactures, her crowded and busy cities, her soils, her canals, her steamboats, her railroads, her turnpike roads evince a progress in the art of civilized life almost miraculous; place her among the fist class of prosperous and improved communities on the earth; and disclose a destiny, to which she is rapidly approximating, rarely presented in any condition of social life. May her progress in the developement of her immense resources still be onward; and so highly blessed with all the means and elements of social prosperity, may she be true to her higher duties and faithful to interests infinitely more valuable than wealth, the social order, the intellectual cultivation, and the moral improvement of her immense and rapidly increasing population.

Of the Island of New-York, little can be appropriated to cultivation, and little is capable of cultivation; and it is in this respect as ungenial as the roughest parts of New-England. Wealth and luxury however, have sprinkled over those parts of it upon which the dense population of the city has not yet encroached, many beautiful embellishments; and labor bestowed in unstinted measure upon small parcels, and stimulated by the unceasing and absolutely insatiate demands of the neighboring capital, have made some of its unpropitious spots fertile and productive. The abundant and I may say magnificent supply of vegetables and fruits in the market of the city of New-York: and a large proportion of them grown within the immediate neighborhood, indicate an extraordinary amount of labor and skill. The farming on Long-Island, within a distance of ten miles of Brooklyn, towards Jamaica, is in many places very fine, limited mainly to the production of vegetables, fruit, and grass. Beyond this I have had no opportunity of extending my excursions; but what I saw in this distance sevred only to strengthen the desire to proceed further and see more.

The passage up the Hudson now so common and familiar loses none of its interest by repetition. In a fine day it presents an uninterrupted succession of picturesque and interesting objects. The height of the banks however renders it impossible to know much of the cultivation, though occasional views are presented indicating an intelligent and highly improved and productive husbandry. Orange, Duchess, and Columbia have long been celebrated for their improved and successful husbandry; and for their crops, their flocks, and their dairies. The butter of Orange County known in New-York by the name of Goshen butter, has an established reputation throughout the country. It is not all of equal goodness; but the first quality of Goshen butter for ferkin butter deserves all the commendation, which it has received. The advanced price which it always commands, one would think would be a sufficient stimulus to more care, neatness, and skill among other farmers in this most important article of farm produce; but with the exception of the Philadelphia market, where this article is always prime, it must be admitted that few things come to the market of a poorer quality or in a more miserable condition than this; and as to the quality of that which is found at the tables of steam-boats, canal-boats, and hotels, it is in general detestable, and fit only for the making of soap, or the greasing of cart-wheels. In a journey of three thousand miles the public tables in a great majority of cases presented butter of a quality that even our recollection revolts from. Why it is so, what are the causes of failure in the manufacture and preservation of this article, we shall probably hereafter take an opportunity to consider; but almost the whole may be comprehended under one general fault in one part of the process or another; and that is the want of cleanliness. This is one of the cardinal sins of the country. I recollect some years since staying at a lodging house at some Medicinal Springs, at that time a place of much resort, where it was ascertained that the butter from which the public table was supplied was kept in an open ferkin under the bed in the family bed room! The flavor of much of the butter which is put upon the public tables indicated its residence in some depository of broken meat, and sour bread, some musty closet, by the offensive odor of which the "whole lump is levened." I have always admired the ethical arrangement of an old friend, in whose moral calendar cleanliness was ranked next to godliness; and I confess I am sometimes more than half disposed to regard it as important in respect to morals as to comfort.

Dutchess county is distinguished for its excellent wool and the quantity of Pork, which it sends to the New-York market. A large amount of beef likewise is stall fed in Dutchess county. Hitherto I have had an opportunity of glancing only at some of the Dutchess county farming, so much celebrated; but I am anticipating with great interest the pleasure of looking at it with more leisure and advantage at some future time. The farm of Mr. Holbrook at Hyde-Park, I have visited with great satisfaction. He is fortunate in the services and an intelligent and skilful steward. Mr. Thomas Midford whose excellent management, especially in his dairy, and particularly in the raising of young stock, I have peceuliar satisfaction in acknowledging. The calves and young cattle which I have seen reared by him, have been of a superior description and evinced the most skilful and faithful attention. The churning here is done by water power, and all the dairy arrangements are admirable, as I have seen on a former visit. Mr. Midford's crops of corn and of ruta baga have been large and fine, and his ploughing and sowing very superior. The condition of the premises throughout, indeed, garden and pleasure grounds, as well as farm and its appendages, evince industry and skill on the part of the laborers, and taste and liberality on that of the proprietor.

February 1837. H. C.

BEET CULTURE.

INTERESTING CORRESPONDENCE.

We have been favored with the following letter to Mr. Clay, together with Mr. C's. reply.—[United States Gazette.]

PHILADELPHIA, Dec. 19, 1836.

SIR,—Not conversant with the intended movements in regard to the proposed reduction of duties on various articles, but having glanced over the proceedings of congress and noticed that the subject will soon be before that body, and from the remarks on the proposed repeal of duty on Sugar, my mind reverted to that subject in which I have now for a year past, been so deeply interested. My pursuits are mercantile, but I feel that interest for any branch of industry that will benefit the country, that I have, so far as my efforts could avail, done all in my power, and I trust not without success, to introduce and establish in the United States, the culture of the Sugar Beet and the manufacture of Sugar therefrom.

I am aware it is making a great demand upon you, still I wish, most earnestly, to obtain your attention for a moment. I have recently been in a position to meet and become acquainted with Mr. James Pedder, from England, who had for years kept his eye upon the progress of the subject of making some attempt to introduce the same into

the United States. I declined at first, persuaded that influence far greater than mine would be needed to introduce the matter successfully to our citizens.

However, deeming "nothing impossible to a willing mind," I proceeded. I introduced Mr. Pedder to our best agriculturists and chemists, and through them to James Ronaldson, Esq. Mr. Vaughan he had already known for several years. Mr. Vaughan, Mr. Ronaldson, and myself, conferred on the subject frequently, in Dec. 1835, and January 1836. I sought and procured such information as I could from the Journals of France and other publications, which was sufficient to decide its practicability, and became evident that it only required a hearty effort somewhere in order to succeed. With a subscription of $50 each from John Vaughan, James Ronaldson and Samuel Richardson, Esqrs., of this city, we enabled Mr. Pedder to depart for France, by agreement made on the 6th Feb. 1836, (vide his Report) which was entered into with him in the names of Mr. Ronaldson, Mr. Vaughan, myself and others, and he departed from New-York on the 10th day of Feb. 1836, furnished with advances and credit on London to prosecute his object even beyond the terms of the agreement, if found requisite and useful. After his departure, every exertion was made to raise donations sufficient to meet the expenses of the undertaking, to INTRODUCE ALL REQUISITE ATTAINABLE INFORMATION, without any intention on our part ever to profit by sugar making. It was thought that a society would aid the thing, and disseminate it more advantagously.

Accordingly, from among the donors, the BEET SUGAR SOCIETY, was organized, but few of its members ever became sufficiently interested to take an active part. This was owing, I suppose, principally to their conviction that the undersigned was so actively engaged in it as to leave little to be done by them, beyond the liberal pecuniary aid which they cheerfully extended. To the active exertions, however, of my worthy colleague, Benjamin M. Hollinshead, complete success, in carrying through our first views, has been secured.

Mr. Pedder wrote to me on the subject, from France, and his letters were published. He returned and made the Report I send you herewith.

About 500 lbs. of seed, from France, have been disseminated through the country from Missouri to Maine.

I visited our State Legislature a few days before they adjourned last session, and though business was pressing upon them, obtained their very favorable notice of our efforts, by a reference (made indeed at an unseasonable time, but unanimous) to the Committee on Agriculture, and the same evening met the committee, who, satisfied, no doubt, of the propriety of the measure, reported next day and recommended an appropriation of three thousand dollars, to be placed in the hands of the Governor, to be applied to the introduction and dissemination of information relating to the manufacture of Beet Sugar and its encouragement, in the State of Pennsylvania.

From a press of business, though this recommendation unanimously passed the Senate, it failed to be noticed in the House, a circumstance, since, most deeply regretted by me, as it would have secured the active existence of the Society organized, and placed in their hands means to have rewarded ingenuity, by premiums, and made successful experiments in the production of sugar from our own soil. Thus left, with a heavy expenditure, and to reimburse the expenses of Mr. Pedder's mission, expense of the seed previously gratuitously distributed, publications, &c., reliance was had upon the well known, but too often taxed liberality of a certain portion of the benevolent and patriotic citizens of Philadelphia.

In this position of things, I have certainly the satisfaction to know, that the exertions, which have not been without labor, have availed much; for I am persuaded that the growing of the sugar therefrom, are destined soon to become parts of the agricultural and mechanical industry of the United States.

Even should no fostering care be extended to it, (such as wisdom and prundence would dictate,) native ingenuity, industry and perseverance, untrammelled by speculative jobbing, or joint stock beet sugar companies and land speculations, will fix it in the United States; and I think it is not going too far to predict that, in the present age, the product of sugar from our own soil, from the beet-root, will supply our own demand, and perhaps more.

France produced last year EIGHTY MILLIONS OF POUNDS OF BEET-ROOT SUGAR! more, by one-third, if I mistake not, than our Louisiana crop of the same period!! What does this not predict with our favorable soil and climate, where, already, this year, from the seed we have distributed, eleven per cent, of good granulated sugar is said to have been obtained from the root which in France yields but six per cent. average, and never over eight? My own observations have not positively verified this, but I am led to believe that it was obtained in the vicinity of Albany, New-York.

From the result of my own experiment (I have had opportunity to make but the one) though from accident my sugar did not granulate properly, I am fully satisfied that 8 per cent. of good sugar for refining, is to be obtained in the United States, from the beet-root.

The growing of Sugar Beet, and manufacture of sugar in the United States, so far as relates to this vicinity, stands thus:—In and about Philadelphia all who are interested (except indeed a few who have this season made and exhibited to me small quantities of sugar better than any I have seen from France,) are waiting to verify the success of others—every man is looking to his neighbor. In other sections of the country the subject has lately been taken up with more spirit. In March last, I received, in an indirect manner, a communication from Mr. M. Isnard of Boston, applying to be engaged in some branch of the manufacturing, by our society, under the impression that its object was the manufacture of sugar. Then, no society had yet been formed.

Informed of the real object we had in view, he turned his attention to excite an interest in Boston. Having had considerable practical experience himself, in all the departments of Beet-root sugar making, from having been engaged in its manufacture in France, he has, by his efforts, contributed to give an impulse to it in the State of Massachusetts.

Joint Stock Companies, Land Speculation, and a variety of ways for making money have been proposed, but none having for its object the true purpose of those engaged in this matter.

Some, disappointed in their visionary schemes of profit from the sudden increased value of land from its introduction, and failing to draw into their plans, those interested, have essayed to disparage the efforts of others whose consciousness of their own motives has been their guide, and to discourage its introduction.

Their success, small as it must be, will not be envied by the well wisher of his country's prosperity.

Herewith, I beg leave to transmit to you a translation of a document published by the Royal Society of Agriculture of France on the subject, which do me the favor to peruse at your earliest convenience and hand over afterwards to my friend Dr. Thomas P. Jones of Washington.

Do not suppose for one moment, Sir, that I have any scheme or plan in which I wish to engage you. I make this communication to you, simply because I have confidence in your large, honorable and patriotic spirit, and I am sure that any good work needs only to be known to you, to secure your approbation and enlist your efforts.

In what ways your assistance is to be rendered, I leave, respectfully and cordially, to your superior wisdom.

I am, with great regard and esteem,
Most respectfully, yours,
JACOB SNIDER, Jun'r.

To HENRY CLAY,
Senator of the United States.

WASHINGTON, 27th Dec. 1836.

DEAR SIR:—I received your favor of the 19th inst., with the paper published by the Royal Agricultural Society of France, on the subject of the manufacture of sugar from Beet. I have read those papers with much attention, and interest, attracted by what I had learnt of the progress of that manufacture in France, and by the patriotic endeavors of yourself and others in Philadelphia, to introduce it in the United States. I took pleasure in distributing some of the Silesian beet seed brought from France last spring, and for which I believe I was indebted to Mr. Ronaldson, and I caused some of them to be sowed at Ashland, my residence. Although it was late in the Spring, they grew very large and were more productive than any other beets which I have ever tried. There was a similar result with all to whom I gave any of the seed. I consider, then, that this important and first step towards the introduction of the manufacture of sugar from beet sufficiently ascertained. There is reason indeed to believe that the climate and soils of our country are better adapted to the growth of beets than those of France.

What is now wanted is a knowledge of, and experience in, conducting the processes by which sugar is extracted from the root. The paper from the French Society, which you have done me the favor to transmit to me, throws much valuable information upon

this branch of the subject, and is, I think, worthy of publication and extensive diffusion.

In my opinion, the establishment of the manufature of Beet Sugar in the United States eminently deserves the liberal patronage of government. What, if sucessful, would so greatly redound to the common benefit, ought to be demonstrated by an experiment made at the common expense. For it is the apprehension, incident to all new and untried enterprises that now deter individuals from embarking in this. Owing to the diversity of opinions which exists as to the powers and duties of the general government, which otherwise would be the most fitting to bestow the proper patronage, perhaps an appeal had better be made to the liberality of one of the State governments; and I know of none to which it can be addressed with more propriety than that of Pennsylvania. Fortunately the sum necessary would not be large to make a full and fair experiment.

I have no doubt of the ultimate introduction of the manufacture either with or without the aid of government, and I believe at no distant day a great part of this necessary of human life will be derived from this new source. If we are to credit the authentic evidence obtained from the experience of France, the manufacture of sugar from beet is less costly than from cane.

Ought we not to admire, and to be profoundly penetrated with gratitude for the providential care which, at a moment when, from various causes, the supply of this necessary article is likely to prove inadequate to consumption, opens a new and boundless source, assuring the poor as well as the rich, in all times and in all countries, of an indispensable article of subsistence?

I beg you to accept my individual thanks for your valuable agency in bringing about the naturalization among us of this new manufacture.

I am, with great respect,
Your ob't servant,
H. Clay,

Jacob Snider, Junr. Esq. Philadelphia.

From the Farmer and Gardener.

Sowing of Grass Seeds.—Such farmers and planters as may not have put in their grass seeds last autumn should do so as soon as the frost is out of the ground. For *clover*, there is but one opinion as to the superiority of spring sowing, and although many give the preference to sowing timothy seed in August, still there are those, whose opinions are worthy of consideration, that advocate the practice of setting it in spring on the growing wheat or rye: so also, indeed, with respect to almost every other of the artificial grasses.

If you intend to sow *clover* seed alone on your grain fields, you should not think of seeding less than from 12 to 16 pounds to the acre.

Timothy, if sown alone, should be in the proportion of from 2 to 2½ gallons of seed to the acre.

Rye Grass alone 2 bushels to the acre.

If *Clover* and *Timothy* be sown together, from 10 to 12 lbs. of the former seed and a peck of the latter would not be found too much.

If you purpose carrying your mixture still further, sow 10 lbs. of clover seed, 6 quarts of timothy, ½ bushel of herd's grass to the acre,—or

Of *clover* 8 lbs., *orchard grass* 1 bushel, *tall meadow oat* 1 bushel, and *herd's* grass ½ bushel.

In Europe the following is in many districts a popular mixture, 2 bushels of *rye grass* seed, and from 12 to 20 lbs. of *clover* seed to the acre.

It is usual to sow the orchard and tall meadow oat in early autumn, but there is no question that they would succeed now. The orchard grass should be moisted with water and permitted to remain so for a day before sowing.

Whatever grass seeds you sow on your winter grain, be sure to pass a light harrow, and roller over them. You need not apprehend any injury to your grain, for although some roots may be dragged out, you will be more than remunerated by the addition you will receive from the tillering of the branches of the plants which will be imbedded in the soil during the process. That the grass seed will derive advantage from being thus securely placed beneath the soil, common sense and reason both concur in affirming. They will be much more likely to escape destruction from birds than if left upon the surface; they will vegetate with greater certainty, and being well fixed in the earth, their roots will be much better able to withstand the droughts of summer and the frosts of winter. We need not say that the operation of harrowing and rolling should be performed when the ground is in a state to bear the treading of the horse without injury, as it will strike the intelligent reader that if done when the ground is *wet*, much injury will result to the grain.

Lucerne.—Those who may feel disposed to try their fortune with this valuable grass, can do so as soon as the ground is relieved from the frost and dampness. It should be sown on a dry rich soil, which had been previously well cleaned. From 16 to 20 quarts of seed should be sown. It may be put in with the spring barley and oats. In England and Scotland it is frequently cut four times in a season.

Oats—The earlier, after the frost is out of the ground, that you get your oats in, the better, and if you can possibly spare them, from your other crops, a portion of manure, do so; for you may rest assured, notwithstanding custom has allotted them to grow on the poorest part of the farm, unaided by nutritious substances of any kind, they would be all the better of a dressing of something calculated to urge them forward. It is to be sure in the general by no means a profitable crop, but then it is a most necessary one, and, therefore, should find favor. But should there be no manure to spare, do, if you can, give the soil an extra ploughing, and thus in part atone for your neglectful culture. We often hear farmers complaining of the degeneracy of, and the falling off of this grain in weight, and may not this be accounted for in the fact, that they are generally grown on the very poorest spots that are to be found, and left to grope their way to maturity in the best way they can.

Two or 2½ bushels to the acre is the proper quantity of seed. They should be well harrowed in.

Potatoes—Should the weather admit of it, you should get in your *early potatoes* from the middle to the latter end of this month. But you should not dream of reaping a good crop unless you are liberal in your bestowal of labor and manure in the preparation of the soil. Your ground should have a southern exposure, and either be a good soil naturally, or be made so by art. It should be thoroughly and deeply ploughed and harrowed; then strike your rows about 27 or 30 inches apart, place your sets about 10 inches distant from each other, throw in your rows a goodly portion of unfermented stable manure, then cover them with the soil, either by running a furrow on either side, or by hand-hoeing. In either event, no *clods* should be permitted to come in contact with the sets. As soon as there is the least indication that the potatoes are coming up, run the harrow crosswise the rows; when the potatoes are up two or three inches, plough a furrow on either side from the potatoes; this must be replaced by throwing the furrow back again. This process will greatly improve the tilth of the soil, and thereby afford the young potato plants an additional chance of moving onward in their growth. After the furrow is thrown back, the rows should be gone over with a hand-hoe, cleaned of all weeds, and so regulated as neither to retain too much moisture, nor to present a surface that would easily suffer by drought. In two or three weeks more another ploughing and hoeing will be necessary; for it is important to keep the ground stirred and clean. This second ploughing however should not be so near to the plants in the rows as the former; and after this, the *cultivator* instead of the plough must be used to complete the work in about two or three weeks, which will be determined by the advance of weeds, and the wants of the potatoes.

Carrots and Parsnips.—As soon as the frost is entirely out of the ground, you may begin to sow the seeds of these roots, for field culture, and thence up to the 1st of May, the sooner they are in the larger will be their yield, and as they are alike excellent as food for man and beast, we have always been surprised that comparatively so few were raised. An acre, well prepared and cultivated, in suitable soil, will yield from 500 to 600 bushels, which would be sufficient to keep four cows fully to their milk during the winter.

Manure.—Carry out your manure to your fields in which you intend to use it. If you intend to top-dress your meadows, or growing crops of grain, the sooner that is done the better, taking the precaution never to let your wagons or carts go on either when the ground is soft.

Lime.—If you intend to use any this season, it is time you had made your arrangements for procuring or burning it. If intended to be used on your meadows, the sooner the better it is spread thereon; if on your corn ground, you cannot get it on too early, as it should receive sufficient ploughings to thoroughly incorporate it with the soil.

Ashes.—Do not omit to provide yourself with a sufficient quantity of this delightful substance; to give your corn plants a dres

ing, however trifling the quantity applied, it will speak out most eloquently.

Fences.—See to your fences and have them thoroughly repaired, and thus secure yourself against the inroads of stock of all kinds.

Tools and Implements.—These must be examined and put in order,—and in fact at this critical period of the year, the farmer should have his eyes on the search in every direction.

From the New-England Farmer.

FARMERS' WORK.

Cows which are expected to calve, ought to be lodged by themselves in some convenient place, under cover for a week or two before calving, as such care may be the means of saving the life of the calf, and perhaps of the dam also. In order that it may be ascertained what is the time when cows may be expected to calve, an account should be kept of the time when each cow is put to the bull. The day and night after a cow has calved, she should be put under cover, her drink should be luke warm, and she should not be exposed to the dampness of the night.

Inflamed teats should be washed with two drachms of sugar of lead in a quart of water. Should tumors appear, apply a common warm mash of bran, with a little lard.

To prevent cows from sucking their own milk, it is said that rubbing the teats frequently with old and strong smelling cheese, is effectual.

The following prescription for drying cows, which continue to give milk till too near the time of their calving; or to expedite their becoming fat enough to be good beef, is taken from *Monk's Agricultural Dictionary*, an English work of established reputation.

"Take an ounce of powdered alum; boil it in two quarts of milk till it turns to whey; then take a large handful of sage, and boil it in the whey, till you reduce it to one quart; rub her udder with a little of it, and give her the rest by way of drink; milk her clean before you give it to her, and as you see need, repeat it. Draw a little milk from her every second or third day, lest her udder be over-charged."

From the Genesee Farmer.

INTERESTING EXPERIMENTS IN FEEDING—VALUE OF STRAW, ETC.

Mr. Tucker—Previous to the 1st of January, I fed two heifers (which had their first calves in the spring of 1836, one in calf and the other farrow) with long straw and oil meal; and on the first of January I commenced weighing their milk, and continued weighing for six days, on each of the following feed:

1. Six days on long straw and six quarts oil meal per day, each.

2. Six days on 24 quarts cut carrots and long straw, each.

3. Six days on 24 quarts cut ruta baga and long straw to each.

4. Six days on long straw and six quarts oil meal, each.

5. Six days on cut straw, wet, and six quarts oil meal, mixed, to each cow; and the results were as follows:

When fed on	lbs.	oz.
Long straw and oil meal, an average per day of	31	13
carrots,	28	14
ruta baga,	26	4
oil meal,	30	8
Cut straw, wet, and oil meal,	35	2

I am wintering my cattle, sheep and horses on straw again this winter, and from my own experience and that of my father, I must disagree with you; first, when you say thrashing machines injure straw, (I think they benefit it, any if any injury is caused, it is by the improper manner in which straw is secured;) and secondly, you say barley straw is our best straw. Our stocks have invariably improved when taken from barley straw and put to wheat straw, and fell off in flesh when changed from wheat to barley. They will eat barley straw better than wheat straw, it being much softer, but there is not the same heart in the one as the other.—My team horses do much better on cut straw, wet, and eight quarts oil meal each, per day, than they do on as much of the best of uncut hay as they will eat, and the same quantity of oil meal fed dry.

The *Skeneateles Agricultural Society*, have offered a small premium on each of the following kinds of roots, to be raised next year, viz: Ruta Baga, Carrots, Parsnips and Sugar Beet. The farmers in the town are getting quite engaged in the culture of roots, and I think from the present feeling of the farmers on the subject, there will be a great increase in the quantity raised next year over any past year.

I have fed 60 Ewes on long straw and one bushel of apples, carrots, ruta baga, or potatoes, per day, and I think there can be but few flocks of Saxony sheep produced in this town that will compare with them. I should be glad to feed more roots, but the drought destroyed my crops the last season.

I remrin, yours, &c.

S. Porter Rhoades.

Skeneateles, Feb. 20, 1837.

From the Genesee Farmer.

BARLEY.

In an interesting paper issued in the form of a circular by the Executive Committee of the A. T. Society, I observed the following statement: "It appears by the collector's returns on the Erie Canal, last year, up to the 3rd of October, there were 285,488 bushels of barley received at Albany; up to the same period this year, 72,663 bushels; showing a falling off of 214,285 bushels. We believe there has been a full crop of barley in the State, so that the inference is, that the farmers are feeding it to their cattle instead of furnishing the brewery, to some extent at least."

The fact respecting the falling off is undoubtedly as stated, though I think other causes than the one stated have contributed to this result. In the first place the crop of barley was not an average one in this State; the extreme wet and cold weather of June hindered its growth, where it did not drown and destroy it. In the second place, barley is more extensively used for making bread by many who find it rather difficult to procure wheat, than it has been in any former year. Barley of good quality, and well dried and ground will yield 30lbs. of flour to the bushel, which renders it much cheaper for food than wheat at the present prices. In the third place, as the committee assert, barley is the present year much more generally used for making beef and pork than is usual among western farmers, a result caused by the failure of the corn crop.

But the cause to which the falling off in the transportation of barley to the east is to be attributed more perhaps than to any other, is the fact that it is extensively purchased and used for distillation. It is surprising that while the cry for bread is heard from all parts of our country, men should be found converting what should be the substance of the poor, into their poison.—While the poor houses of our cities and counties are overflowing with families destitute of bread, enough grain is weekly converted into liquor, to supply the whole with all that would be required. One hundred thousand bushels of rye and corn are weekly used in the distilleries of New-York city and its immediate vicinity. The friends of the poor, and the conservators of public morals should think of these things.

A. B.

From the Farmer and Gardener.

LEGISLATIVE PROTECTION TO AGRICULTURE.

We insert in another part of this day's journal, a very interesting report made in the Legislature of Ohio, on the expediency of encouraging the culture of *Silk* and *Beet*. Though young in years, Ohio is a most powerful State; great in all those physical resources and local advantages, which tend to impart importance to her as a member of the union; the influence of her counsels in giving an impetus to those new branches of American husbandry, cannot, therefore, fail to be of infinite service in putting them upon a footing of solidity, which will place them beyond the reach of contingencies, and plead for their encouragement with a force and fitfulness, that must find its way to the favor of the other legislative bodies of the confederacy.

While *Ohio*, in the West, the first of the new States, is nobly championing the cause of Agriculture, we are gratified to find that *New-Jersey*, one of the gallant old thirteen who so generously aided in breaking the shackles of the mother country, in the war of the Revolution—whose sons during that period of dismay and peril, stood side by side with those of Maryland, and Delaware, in the deadly strife—is actively awake in furthering the good cause—and most sincerely do we join our aspirations with those of the editor of the *Bugle*, expressed in the paragraph below, in the hope, that Maryland will not be slow to follow the lead thus auspiciously set her by her ancient ally—nay, we will go further, and hope, that every other State, whose councils have not already done so, will come to the rescue, with a determination to vie with each other, in the holy ri-

valry, of doing their respective States the most service

Culture of Silk and Sugar Beet.—In glancing over a New-Jersey paper we accidentally noticed the following among the proceedings in the Legislature of that State on the 7th inst. It evinces an enlightened policy, and sets an example which we hope Maryland will not be slow to follow.—[Kent Bugle.]

Mr. *Mollesson*, after an interesting report in favor of encouraging the culturs of Silk, and Beet Sugar, reported two bills in favor of the same, and 500 copies were ordered to be printed.

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BUCKWHEAT STRAW.

In answer to a question put to us some time since, by "a young Farmer," whether "any use could be made of his buckwheat straw," we replied that it was better for his milch cows than the best timothy hay, that his cows would eat it with equal avidity; that if it had not been too long exposed to the vicissitudes of the weather, it would prove equally nutritious; that so far as the secretion of milk was concerned, it was infinitely preferrable to any hay or fodder within our knowledge, and that if cut and boiled, it would make most excellent slop for his cows. In a conversation with a gentleman from Virginia a few days since, we were happy to find our own opinion and experience confirmed by an anecdote which he related. At the time of thrashing out his buckwheat, he was from home, and contrary to his usual practice, which was to cast the straw into the barn-yard amongst the other *litter*, his hands stacked it in a fold-yard, with his other hay and fodder, where it was accessible to a portion of his cattle. On his return home, he found that his stock had made as free use of the buckwheat straw, as with either his hay or fodder, thus establishing the fact that these animals, which should be admitted to be judges of what suits their own appetites, when left to their own choice, had by their selection of this hitherto neglected food, pointed out a new source of economy to the farmer and planter, which too many have not properly appreciated. Buckwheat as every one knows, can be grown upon almost any soil if planted from the opening of the ground in spring, till the beginning of July, and will not only yield a handsome return of grain, but a full and wholesome supply of as good hay as any agriculturist ever fed his cattle withal.

"Adversity," to use a trite adage, "is the mother of invention," so should the experience of the last few years teach every one engaged in tilling the earth, to husband every means within his power, and of resorting to every resourse within the compass of his ability, to make his stock comfortable, and keep them in plentiful supply of food during the inclemant months of winter. It is the custom of most farmers to sow buckwheat on the poorest spot on the farm, and even when thus treated, often without manure, with no other culture than a ploughing and harrowing, its product is from 20 to 30 bushels to the acre, according to the season. When placed under more advantageous circumstances, on good soil, or land properly manured, it has been known to give a produce of from 60 to 70 bushels to the acre. If then, instead of sowing a small patch merely to afford meal enough for the winter supply of those delightful cakes, which add so much to the luxury of the farmer's winter breakfast table he were to sow from 10 to 20 acres, how much of profit would ensure to him? how much wholesome food would he secure for his cows? and how much solid comfort to all and every thing around him? Than buckwheat grain, nothing is eaten more readily by the poultry and the pigs. For the former, it is the best in winter, largly contributing by the great proportion of lime of which it is composed, to make them lay; for the latter, or for breeding sows, if reduced to meal and boiled into slop, it is at once nourishing and fattening. For sows with young pigs, nothing is more conducive to the secretion of plentiful supplies of milk. And should the straw be cut and steamed, and thus given to milch cows, it would serve as a substitute for other slops, and would materially increase the quantity as well as quality of their milk.

Besides the above uses of this article, if sown early, in the proportion of 2 bushels to the acre, it would bear mowing twice during the season, and would afford most excellent grass for soiling: and beyond all question, there is no green crops that can be turned in with the exception of a clover-ley, that makes so good a dressing for ground for wheat as does buckwheat.

When sown for the grain, from 1 to 1½ bushels to the acre is enough seed.

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NEW-YORK AGRICULTURAL CONVENTION.

The Albany Argus of the 20th instant, contains the proceedings of the State Agricultural Convention of New-York, convened at Albany, the capital of that State, on the 2d inst. *Anthony Van Bergen*, Esq. of Green county, was appointed President, four other gentlemen, Vice Presidents, and the same number, Secretaries.

A series of resolutions were reported to the Convention and unanimously adopted. We shall give an abstract of these with a view of showing their tendency and character. They set forth:

That it is of primary importance to all, that the great branch of agricultural labor should be specially encouraged and honored, and that the agriculturist should himself receive all those mental aids, and that stimulus to industry, which are calculated to make him more prosperous in his business, and more useful to society.

That we are particularly admonished by the scarcity and very high price of all the products of agriculture, to put forth our efforts to alleviate its labors and increase its productions;—That to the Legislature of the State, as the constituted guardians of the public weal, particularly appertains the duty of fostering and improving this primary source of wealth and happiness:—

That from the experience of the past at home and abroad, the Convention are confident, that the patronage of the government may be advantageously exerted, and without detriment to the financial operations of its treasury, to this great object.

1. By so raising the standard of instruction to the children of agriculture, as to enable them to understand, and to apply to productive labor, the best practices and improvements of the age; and

2. By imitating the successful examples furnished to other governments, of calling forth the skill, industry and competition of our citizens, by pecuniary reward and honorary distinction:—

That influenced by these views, the Convention respectfully recommend to the Legislature, *to appropriate a permanent fund, the interest of which shall amount to at least* THIRTY THOUSAND DOLLARS A YEAR, *to encourage the establishment, and to sustain in usefulness, a Central and County Agricultural societies*, and to promote generally the interests of husbandry, under such regulations and restrictions as to them shall seem meet, and that provision be made by law for introducing into the common schools of New-York, such books of elementary science, as may be best calculated to accelerate improvements in arts of productive labor.

A memorial, embracing the objects above specified, to the Legislature, was also adopted with equal unanimity.

Among the other resolutions adopted by the Convention, we find the following:

Resolved, That the exhibitions made to this Convention, of *silk fabrics and thread*, made from the indigenous mulberry of our country, affords ample evidence that the silk culture is admirably adapted to our soil and climate, and that nature has bountifully supplied us, should foreign resources fail, with an excellent material for its prosecution.

The Convention before adjourning recommended that another Agricultural Convention be convened in Albany on the first Thursday of February next, and that the several counties in the State take proper measures to be represented therein.

We notice these proceedings with feelings of unmingled pleasure, for every movement of the kind must serve to animate the breasts of the agriculturists of our land with the importance of attending to their own interests; for unless they do so, it must be obvious that no voluntary action will take place on the part of most of those who fill our legislative bodies.

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POLICY OF DESTROYING WEEDS.

There is so much true philosophy, so much sound practical sense, in the following extract from one of Sir Humphrey Davy's lectures, that we cannot omit copying it.

"In all lands, whether arable or pasture, *weeds* of every description should be rooted out *before* the seed is ripe; and if they are suffered to remain in hedge rows, they should be cut when in flower, or before, and made into heaps for manure: in this case they will furnish more nutritive matter in their decomposition; and their increase by dispersion of seeds will be prevented. The farmer, who suffers weeds to remain till their ripe seed are shed, and scattered by the winds, is not only hostile to his own interests, but is likewise an enemy to the pub-

lic; a few *thistles* will stock a whole farm; and by the light down which is attached to their seeds, they may be distributed over the whole country. Nature has provided such ample resources for the continuance of even the meanest vegetable tribes, that is very difficult to ensure the destruction of such as are hostile to the agriculturst, even with every precaution; seeds excluded from the air, will remain for years inactive in the soil, and yet germinate under favorable circumstances; and the different plants, the seeds of which, like those of the *thistle* and *dandelion*, are furnished with beards or wings, may be brought from an immense distance. The *fleabane* of Canada has only lately been found in Europe; and Linnæus supposes that it has been transported from America by the light downy plumes with which the seed is provided.

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EXPERIMENTS OF VARIOUS MANURES ON POTATOES.

The following extracts from "*Dickinson's Agriculture*," will show that in Great Britain, particular attention has been given to *salt* as a manure. To show its utility as a manure in a more clear point of view, the following experiments were made by the Rev. Mr. Cartwright.

A certain portion of soil (ferruginous sand brought to a due texture by a liberal covering of pond mud) was laid out in beds one yard wide and forty long: of these, 25 were manured, the first excepted, as follows:

No. of Beds.	Kinds of Manure applied.	Product of Potatoes.
1	No manure	157
2	Salt, ¼ peck	198
3	Lime, one bushel	150
4	Soot, one peck	192
5	Wood ashes, two pecks	187
6	Saw dust, three bushels	155
7	Malt dust, two pecks	184
8	Peat, three bushels	159
9	Decayed leaves, three bushels	175
10	Fresh dung, three bushels	192
11	Chandler's graves, nine lbs.	220
12	Salt, lime	167
13	Salt, lime, sulphuric acid	175
14	Salt, lime, peat	183
15	Salt, lime, dung	199
16	Salt, lime, gypsum, peat	201
17	Salt, soot	240
18	Salt, wood ashes	217
19	Salt, saw dust	180
20	Salt, malt dust	189
21	Salt, peat	171
22	Salt, peat, bone dust	178
23	Salt, decayed leaves	187
24	Salt, peat ashes	185
25	Salt, Chandler's graves	195

"The quantity of ingredients the same as when used singly.

On the same day the whole was planted with potatoes a single row in each bed; and that the general experiment might be conducted with all possible accuracy, each bed received the same number of sets.

On the 21st of September, the potatoes were taken up, when the produce of each row was according to the annexed table.

It is observed as being remarkable, that of ten different manures, most of which are of known and acknowledged efficacy, *salt*, a manure hitherto of an ambiguous character, is superior to them all, one only excepted, and that when used in combination with other substances, it is only unsuccessfully applied in union with that one, namely, *Chandler's graves*, no other manure seemingly being injured by it: possibly its deteriorating effects on Chandler's graves may be owing to its antiseptic property, which retards the putrefactive process by which animal substances undergo the changes necessary to qualify them to become the food of plants. This, however, he cannot, from any appearances in the soil when the plants were taken up, assert to have been the case. The extraordinary effects of salt, when combined with soot, he thinks are strikingly singular: there is no reason to suppose these effects were produced by any known chemical agency of soot and salt on each other. Were he to guess at the producing cause, he should conjecture it to be that property of saline substances by which they attract moisture from the atmosphere; for he observed those beds where salt had been used were visibly and palpably moister than the rest, even for weeks after the salt had been applied, and this appearance continued until rain fell, when of course, the distinction ceased. This property of attracting moisture had greater influence possibly, on the soot than on any of the other manures, as soot from its acrid and dry nature may be supposed to require a greater proportion of water to dilute it, than those substances which contain water already. It may be proper to observe, that on those beds where salt had been used, the plants were obviously of a paler green than the rest, though not less luxuriant: a circumstance which he thought worth noticing, and which he considered, though erroneously (as appeared by the event,) to indicate a want of vigor, which would be felt by the crop. It was observable also, that where salt was applied, whether by itself or in combination, the roots were free from that scabbiness which oftentimes infects potatoes, and from which none of the other beds (and there were in the field nearly fifty more than what made part of these experiments) were altogether exempt."

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BURNING SURFACE SOIL AND CLAY.

The following simple and cheap process of burning surface soil and clay, and thus adding to your quantity of calcareous manures and increasing your ability to improve your lands, is very stronly recommended by that eminent English agriculturist, Mr. Curwen. Those living remote from large cities, whence supplies of ashes are usually drawn, and in the neighborhood of lime regions, could in this way, at a very trifling expense obtain ample resources for top dressing their meadows, corn fields, grain fields, and greatly multiply their ability for raising turnips and root crops generally.

Mounds of seven yards in leng'h, and three and a half in breadth, are kindled with seventy-two bushels of lime. First a layer of dry sods or parings, on which one half of the lime is sqread, mixing sods with it, then a covering of 8 inches of sods, on which the other half of the lime is spread, and covered a foot thick; the height of the mound being about a yard.

In 24 hours it will take fire. The lime should be immediately from the kiln. It is better to suffer it to ignite itself than to effect it by the operation of water. When the fire is fairly kindled, fresh sods must be applied. It is best to obtain a considerable quantity of ashes before any quantity of clay is put upon the mounds. The fire naturally rises to the top. It takes less time, and does more work to draw down the ashes from the top, and not to suffer it to rise above six feet. The lime is supposed to add full its worth to the quality of the ashes. Where limestone can be had it would be advisable to burn a small quantity in the mounds, as it would be a great improvement to the ashes, and at the same time help to keep the fire in.

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METHOD OF BURNING LIME WITHOUT KILNS.

The practice of lime-burners in Wales was formerly to burn their lime in kilns, made broad and shallow, but lately they have begun to manufacture that article without any kilns at all.

They place the limestone in large bodies, the stones not being broken small, and calcine these heaps in the same way used for preparing charcoal. To prevent the flame from bursting out at the tops and sides of these heaps, turfs and earth are placed against them, and the aperture partially closed; the heat is thus regulated and transferred through the whole mass, and notwithstanding the increased size of the stones, the whole becomes thoroughly calcined. As a proof of the superior advantage that lime burnt in these clumps has over lime burnt in the old method, a preference is always given to that burned in heaps. This practice also prevails in England and Scotland.

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TANNERS' BARK.

There is much doubt and scepticism prevailing with respect to the relative value of this substance as an improver of the soil. While some contend that it is a cold, inert body, deprived, by the process of tanning of its nutritive properties, others object to it upon the score of its being too heating. Here are qualities ascribed to it as opposite as human opinion can make them; but as it is among the infirmities of his nature for man to err in judgment, may it not be that neither of these opinions are correct. Prejudice too, may have its share of influence in the formation of them, and the truth may be found in the fact that their substance does not possess any one of the qualities here ascribed to it, in any injurious degree, but may in fact combine those which would render it, after being submitted to a judicious chemical process, a highly valuable manure. That the *tanning* principle is extracted no one can question; but in undergoing that deprivation, may it not imbibe other qualities equally conducive to the

growth of vegetables? In the tanner's vat, it is placed in close contact with hides, and may it not receive certain portions of animal matter, eminently calculated to advance the healthful nurture of plants?—While in the hands of the tanner, more or less of lime in some of its forms are doubtless imparted to it. This, we know, when combined with earthy matters, or hard woody, fibrous substances, promotes active decomposition, and consequently, the elimination of gaseous particles, which becoming incorporated with the soil, form a valuable part of the pabulum of living vegetables. We are told upon the highest authority that when lime, whether freshly burnt or slacked, is mixed with any moist, fibrous, vegetable matter, there is a strong action between the lime and the vegetable matter, and they form a kind of compost together, of which a part is usually soluble in water; and that by this kind of operation, lime renders matter which was before comparatively inert, nutritive. Now, may it not be, that all that is wanting to render tanners' bark easy of decomposition, and to convert it into nutritive matter, is the application of a proper portion of lime, or some other substance capable of generating heat? Fermentation once excited, if permitted to go on, would soon convert it into a black vegetable mould. In that state, all would admit its applicability for the production of the food of plants. Rotten tanners' bark mixed with silicious earth, we all know, makes one among the best preparations for the flower bed; indeed we know no mould superior to it; from many years experience we can say that we would prefer it to any other. If then, it was that inert body which some would represent it, it certainly could not gain any thing by its combination with silica to impart to it that principle of active vegetation which it undoubtedly possesses. But let us see what is taken from it in its process of tanning.—The best oak bark, cut at the most auspicious season of the year, contains but 29 parts of the tannin principle out of 480 parts, and surely the abstraction of this minor portion of its whole constituent body, does not materially impair the capacity of the residuum for the purposes of production. But what has been found to be the constituents of this residuum? Why, by a minute analysis of 1,000 parts of dry oak bark, it was found to contain

Of woody fibre	876
Tannin	57
Extract	31
Mucilage	13
Matter rendered insoluble during evaporation, probably a mixture of Albumen and extract,	9
Loss—partly saline matter,	9

It must, therefore, be obvious from this exhibit, that after the separation of the TANNIN principle, there still remains much in the tanners' bark, which may be converted into vegetable nutriment, for of a thousand parts, only fifty-seven are found to combine with, and form a part of, the hides in the process of tanning. The substance abstracted, amounts to less than 6 per cent.; for as the analysis was made by incineration, the *loss* set down should not enter into the account against the residuum. Every one at all conversant with the *constituent properties of manure*, and with the physiology of plants, do know, that the substances which sustain the vitality of growing vegetables must be taken up either in a *liquid* or *gaseous* form, and that the exquisitely delicate ducts of their lymphatic vessels cannot receive any thing solid into them. From these premises, it is fairly deducible that tanners' bark, once reduced to vegetable mould, would be a valuable and healthful manure; the process then, by which it can be *reduced*, becomes an object of importance, and it is equally so, that by admixture with earth and lime, with unrotted horse manure or ashes, its decomposition can speedily be effected. Would it not then, in the absence of other vegetable matter be a valuable substance to spread on all fields where lime was intended to be used, whereon no clover-ley or grass sward existed? It strikes us that it would be; and we recommend its use, from an honest conviction that the happiest meliorating effects would result from it.—Deriving, as tanners' bark do, no little portion of animal matter during the period which it lies in contact with the hides, it may be said to possess both animal and vegetable salts, therefore, must be presumed to be highly forcing in its properties, and, hence, peculiarly adapted to tenacious soils, which may be, naturally, deficient in vegetable matter.

From the New-England Farmer.

MR. FESSENDEN:—If the following remarks are worthy of a place in your useful paper, you are at liberty to publish them, some years since there was a great scarcity of hay. At that time I had on hand a large stock of cattle. Sometime in the month of February my stock of hay was about all gone, and where to obtain more, I could not tell. It could not be had short of 20 miles, and there at the price of thirty dollars per ton.

One day I went to the stable, and no sooner than I entered, every eye was upon me for aid. You may imagine what my feelings were, when I knew of no relief which I could bestow. I stood a while to reflect on what course to pursue, or what to do. At last I thought of some flax which had been lying on the beams of my stable for several years, which had not been rotted. I threw down a few bundles, and gave some of the flax to my cattle. They took hold of it with such eagerness, that I was obliged to take it from them to prevent their being choked with it. I then took a block of wood and a broad axe and chopped it up short. I then gave a very little to my cattle, and continued so to do, until it was all gone.

From what I then discovered of the virtue and oily substance that the flax contained, I am of opinion that what I could take up between my two hands and fingers, after being chopped, and given to a cow each day through the winter, would carry her through the foddering season. My opinion is that the bulk of one ton of hay in flax, will be of more value to a stock of cattle than four tons of hay. I am also of opinion that oil can be obtained from flax. As I have an oil mill, I intend to try the experimeut the ensuing season. I would recommend to farmers to sow more seed the coming spring than usual; for flax and the seed are of more value than people are aware of. STEPHEN PERLEY.

BY THE EDITOR.—The use of unrotted flax as food for cattle is new to us, and we have never, before we received Mr. Perley's communication, heard or read of its being applied to that purpose. We are of opinion that Mr. P. has made a valuable discovery, and are much indebted to him for its communication.

For the New-York Farmer.

No. III.

GENERAL SKETCHES—WESTERN NEW-YORK.

BY H. C.

I could not pass Hyde Park, without paying in my own view a tribute of respect to the memory of its late public spirited proprietor, the late Dr. David Hosack, many years distinguished among the eminent citizens of the State, by his generous patronage of all public improvements. His botanical establishment near the city of New-York, was at one time a great honor to the State, which purchased it of him at less than half its cost; and which by the neglect of the State was permitted to fall into decay and ruin. He entered upon his agricultural pursuits with extraordinary zeal and liberality; determined to carry his farm to the highest degree of cultivation and improvement of which it was susceptible; and to stock it with the best animals, of the best breeds, which money could procure. His sudden death put an end to these plans fraught with great public utility; and left only the feeling of deep regret and disappointment to mingle with our respect for his private virtues, and his eminent public spirit, usefulness, and patriotism. The place has now passed into other hands, who are about availing themselves of its distinguished advantages for manufacturing purposes, and the site of a village.

The neighborhood of Albany, in an agricultural view, affords little to interest except some few eminent examples, well known to the public, of the triumph of industry and skill, over a soil by nature altogether unpropitious and forbidding. The country over which the railroad car flies, in its passage from Albany to Schenectady, is one of which we could desire nothing than a bird's-eye view; and has been well denominated by some traveller, "the abomination of desolation." The banks of the Mohawk at Schenectady, stretching out into wide and beautiful intervales, are certainly worthy of a much neater and higher cultivation than they have received, and, judging from the most transient view, must be eminently productive in good seasons in Indian corn. In the vicinity of Albany, several instances have

come within my knowledge, in which large farmers, have been compelled to abandon the cultivation of wheat on account of the ravages of the grain worm; a pest which threatens most seriously the agricultural prosperity of New-York.

I was unfortunate in my passage from Schenectady to New-York, on the newly opened railroad, first on account of a severe and continued rain through the afternoon and night; and next, from some imperfection in the engine or its management, by which we were kept eighteen hours on the road, and were compelled to pass all the night in the cars. Here and there, however, we caught a glimpse of the country and some of the beautifully situated and finely cultivated farms on the Mohawk, and obtained most favorable impressions of the condition and capabilities of the soil in the fertile intervales and meadows. The road is laid almost the whole distance on the banks of the river. The German flats near Herkimer, from their celebrity scarcely need remark; and the vicinity of Utica is picturesque, luxuriant and well cultivated.

The canal leaving Utica, passes through Whitesboro; and I have rarely seen any thing which surpasses this country in beauty and fertility. On the long level from Utica to Syracuse the country is not particularly interesting, as the canal passes through the least settled parts; and the little villages, or rather watering places, which have been planted on the borders of the canal, are any thing rather than agreeable. Of Syracuse, the great Saline of the country, I shall say nothing at present, as I design principally to confine my observations to matters connected with agriculture. The soil in the immediate vicinity of Syracuse or Salina is not fertile; but great efforts are now being made, and large expenditures incurred to bring by draing and clearing some places into cultivation, which must ultimately be highly productive. The passage to Oswego, and return to Syracuse by canal and river gave me an opportunity of seeing the land on the banks of the river Seneca; and few parts of the country, which I have ever seen, surpass this in beauty or fertility. The land at present requires no manuring; and the application of plaster which is found in abundance in this neighborhood, and obtained at as low a rate as twelve and half cents per bushel., has proved signally beneficial. The hydraulic power in this vicinity is immense; and one would think almost inexhaustible. Many families however are emigrating even from this fine country to the far west; so that man never *is* but always *to be* blest.

The passage from Syracuse to Rochester, at least that part of it, which is passed by day light, presents nothing interesting. The Montazuma marshes are very extensive; and an intelligent fellow passenger suggested that they might one day be drained; but from appearances its practicability seemed questionable; and in any case, with the present amount of land of the finest description unsubdued and capable of cultivation, the prospect of such a project being undertaken seems extremely remote. The insalubrity of this place may perhaps at some future time induce this rich commonwealth to undertake it. Lyons, a pretty village at which we stopped an hour, presents several beautiful examples of ornamental and productive horticulture, in the articles of flowers, grapes, and other fruits.

At Rochester my stay was necessarily short, as my time for reaching Buffalo had been fixed by previous engagement. This town has greatly increased since my visit here in 1825. It is making large and fixed strides in business and commercial prosperity. But a small part of its mighty water power has yet been brought into use; and the fertility of the surrounding country, and the rapid increase of its population, must operate greatly to the continued prosperity of the city. I learned the great appreciation in value of farming lands in this neighborhood; and much regreted that I could not visit Wheatland and some other places in the vicinity, which were represented to me on as competent authority as there is in the State (Jesse Buel, Esq.) as among the best wheat lands in the country.

At Rochester I took the stage by the Ridge road, to Lockport. This road, well known to all travellers, is made on an extraordinary ridge of land, which appears almost to have been formed by art, rising upon an average of about fifteen feet above the level of the land on each side of it; and extending in length more than seventy miles, free from stones, and presenting for the greater part of that distance as fine a road as can be found. It is conjectured to have been formerly the shore of the Lake, which it is supposed has gradually receded; and now lies along it at an average distance of eight miles. To the west of the ridge the land is level as far as I could see; and to the east it has a slight inclination towards the lake. The growth of timber is heavy, and the soil deemed highly favorable for wheat, oats, and grass. There is no village of any importance on the whole route; but the country is generally settled; and the farm houses have an aspect of unusual thrift and comfort. The proximity to the canal on the one side, and lake Ontario on the other gives to this country peculiar facilities of intercourse with the great markets; and this added to the excellence of the soil must presently create here a dense and busy population; at present however, with this as with many other parts of the country the cheapness of the rich soil in the west, the increasing facilities of emigration, the rapid advance of property in those western settlements, and added to all the electrical charms of emigration, which make obstacles and difficulties fade away, will operate against an immediate increase. Remarkable indeed as the fact may seem, my own observation shows that no section of the country has within the last two or three years sent out a larger proportion of emigrants to the west than Western New-York. Now what is the reason of this; certainly not that the agricultural advantages of Western New-York are not equal to any part of the world. But several other reasons may be assigned. One is that the scene of speculation in the West, especially in Michigan, is nearer to New-York than to many other parts of the country; and the facilities of emigration by canal and steamboat, are as great as could be desired. They are therefore more within the moving and attracting waters of the vortex of excitement. In the next place many of the settlers in Western New-York, either took their land in its original state, or bought in at a low rate from the first settlers, and being, by the improved condition of their estates, as the general advance of the price of landed property, considerably enriched, they sell and immediately proceed to invest their increased means in the cheap and rich lands of the west; and go out with large and vigorous families, "to cause the wilderness to blossom like the rose." Of the many hundred of settlers whom I met in Michigan, a large proportion of them, there was no difficulty in ascertaining, were from Western New-York; and from their manners, clothing and equipments, they showed themselves to be among the most substantial and independent yeomanry of the country.

From Rochester my passage was made in the night to Niagara River. I lost at that time sight of the beautiful lands on the Tonawanda Creek. A prejudice has existed against these lands from their reported unhealthiness, on account of the back-water, occasioned by the dam at the village. But there is good reason to believe that this prejudice is unwarrantably strong; and that the clearing of the country, which is rapidly going on, will, as in other cases, obviate these objections, which have, no doubt, operated against its settlements; and when the present violent tide of emigration has in some measure slackened, show the extraordinary advantages and desirableness of their lands.

Feb. 1837. H. C.

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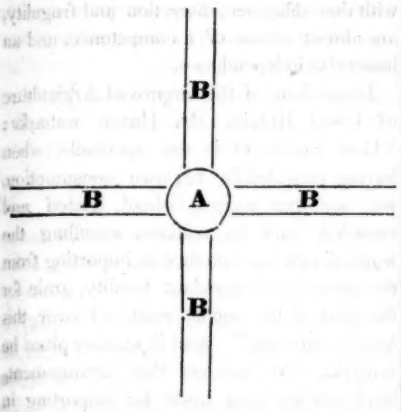

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B.B.B.B. Trenches, 1 foot wide and 1 deep, extending the whole length of the kiln and communicating with the centre A. These trenches or flues must be kept open during the whole operation of burning, as the perfect burning of the shells depends upon it. In order to keep them open, large green logs of wood that will not burn out speedily must be placed cross-wise, close to each other, and if entire logs extending the whole length of the kiln so much the better. Wood must now be put over this entire surface, say 2 *feet* thick, then throw on oyster-shells, say 1 foot deep, levelling them so as to present an even surface; then wood 2 feet deep, next oyster-sheels 3 feet deep, and so on alternately, increasing the quantity of shells and decreasing the quantity of wood as you progress up to your terminating point. It is important to preserve the kiln *square*.

In order to secure a good fire at the onset, brush-wood, old dry stumps, or dry lap-wood of any kind should be liberally intermixed with your other wood, and after the kiln becomes once thoroughly ignited, there will be no other difficulty than that of preserving an equality of heat; this with very little attention may be effected.—Whenever the burning is greater at one point than another, the flue, or trench, in that direction should be stopped up with mud or earth, which must be removed, as necessity may indicate. After the kiln is fairly fired, one or two men at farthest will be sufficient to watch it, as the only care necessary is, to check any irregularity of the burning by throwing mud on the part.

The shells will effectually be burnt in about three days.

From the Horticultural Magazine.

ON THE CULTIVATION OF THE HYDRANGEA, (H. HORTENSIS.) BY THE CONDUCTOR.

This very showy and highly ornamental plant, though it has long been cultivated, is far from being very common. Indeed fine specimens are not often seen, and we may infer that the want of better information in regard to their cultivation is one cause why they are not grown to greater perfection.—The peculiar soil which they delight to grow in, and in which alone they ever flourish successfully, is not always to be conveniently found; recourse is consequently had to the common earth of the garden, in which they grow tolerably well for a little while, but finally dwindle away and die. Persons unacquainted with the plants, at all, are apt to kill them immediately; having a desire to enrich the soil, manure is added, which is sure death to them. The following few hints may be therefore of some service to our readers.

Hydrangeas are cultivated by layers and by cuttings; the former make the largest plants in the shortest period of time, but the latter method is the most convenient, and the plants are handsomer shaped. To propagate by layers, all that is necessary is to plunge the plant in the garden, or turn it out into the soil, and place round it some suitable earth; then make a slit in the shoots, longitudinally through a bud, and peg them into the soil, covering them over an inch or two in depth. The operation may be done either before or after the plants expand their blossoms; in either case they will generally root very easily. To propagate the plants by cutting, the shoots should be taken off in the spring, about a fortnight previous to the breaking of the buds, just as they begin to swell, or in the fall, two or three weeks after they have finished their summer's growth, and the wood begins to harden. The former season may be chosen to procure flowering plants of a small size, but the latter should be preferred where the object is only to get plants, without any regard to their early blooming. Cultivators who put in cuttings in the spriug go over the old plants and select such shoots, as, from their swelled appearance and firm feeling, they judge will throw out flower-buds; these are cut off below a bud, with from one or three inches of the wood, and are inserted singly in small pots, and plunged in a gentle bottom heat, and shaded from the rays of the hot sun; they soon emit roots, and they are then shifted into the next size pots, (No. 2.) in which they generally produce a fine large umbel of flowers. Plants thus treated have a very pretty appearance, the flowers sometimes being three times the size of the pots they are growing in. This mode may be adopted with amateurs, but is attended with more care than that of taking off the cuttings in the autumn.

After the summer shoots have acquired some solidity, and begin to assume a slightly brownish tinge, cut off the ends of as many as there are plants wanted; let them be about four inches long, and contain six leaves; be careful that they are cut across, directly under a bud; trim off the two lower leaves, and insert each cutting in a No. 1 pot. Place them in a frame or against a north wall, where they will be shaded from the sun for a month; by the end of this period they will have made sufficient roots to be removed to a warmer situation, where they may remain until severe frosty weather, when they must be taken into the greenhouse frame, or, in want of either of these, the celler. The soil in either of these modes should be composed of peat or leaf mould, with the addition of about one-third sand.—Out of twenty-five cuttings, the most we ever put in at any one time, not one failed to grow treated in this manner.

The after management of the plants is very simple; the following season they should be shifted into No. 2 pots; and, as they continue to grow, they will require larger ones, until they reach such a size as to need large tubs. The soil should be peat, from low situations, or bog earth, or, if these cannot be procured, leaf mould. Give a good drainage to the pots, as stagnant water is injurious to the roots. When the plants come into bloom, keep them well saturated with water, and let them stand in situations where the sun shines only a few hours in the morning. The proper season for potting is early in March, just before the plants begin to grow.

Much has been written respecting the cause of the flowers sometimes opening blue and at others red, various modes have been recommended to make the plants produce those of the latter color. Bog earth, loam, and saturating the plants with water, in which iron filings have been steeped, have each been tried, to produce the effect, and each have answered as well as failed to do so.—That it is owing to the presence of oxide of iron in the soil we have no doubt; and when bog earth or loam can be procured of the right kind, the color will be changed. This we know to be the fact. A few years since we tried the experiment upon a plant; it was an old one, and was separated so as to make two; one was planted in bog earth, and the other in a hazel colored loam: the flowers of the one in the bog earth were red, and on the other, in loam, were of a more intense blue than any we have over seen since.—Cuttings that we have raised and planted in the same loam have flowered blue. There are, perhaps, few soils that possess this property, but when one is found a stock of it should be secured, if blue flowers are desired; the plants do not, however, grow so vigorously as in bog earth. It is a good plan to grow the plants a year or two in loam, and then shift them into the bog earth; but it must be remembered that the latter soil will sometimes produce blue flowers.

Hydrangeas should then be in every garden: the long period which their flowers remain in perfection, and the care with which

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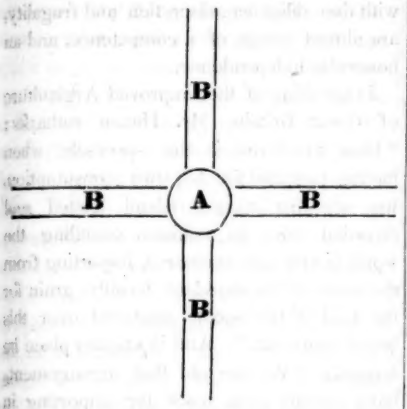

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To burn a kiln of 3,000 bushels of oyster shells the kiln must be 33 feet square, and be constructed as follows:

A. A circular excavation, or pit, 3 feet wide, and 1 foot deep. In this centre, wood 4 or 5 feet long is placed endwise, forming an arch or partial funnel, beneath which place straw, brush or other small dry wood that will ignite rapidly, so that fire can be communicated through the flues by means of a rod or pole attached to it.

B.B.B.B. Trenches, 1 foot wide and 1 deep, extending the whole length of the kiln and communicating with the centre A. These trenches or flues must be kept open during the whole operation of burning, as the perfect burning of the shells depends upon it. In order to keep them open, large green logs of wood that will not burn out speedily must be placed cross-wise, close to each other, and if entire logs extending the whole length of the kiln so much the better. Wood must now be put over this entire surface, say 2 *feet* thick, then throw on oyster-shells, say 1 foot deep, levelling them so as to present an even surface; then wood 2 feet deep, next oyster-sheels 3 feet deep, and so on alternately, increasing the quantity of shells and decreasing the quantity of wood as you progress up to your terminating point. It is important to preserve the kiln *square*.

In order to secure a good fire at the onset, brush-wood, old dry stumps, or dry lap-wood of any kind should be liberally intermixed with your other wood, and after the kiln becomes once thoroughly ignited, there will be no other difficulty than that of preserving an equality of heat; this with very little attention may be effected.—Whenever the burning is greater at one point than another, the flue, or trench, in that direction should be stopped up with mud or earth, which must be removed, as necessity may indicate. After the kiln is fairly fired, one or two men at farthest will be sufficient to watch it, as the only care necessary is, to check any irregularity of the burning by throwing mud on the part.

The shells will effectually be burnt in about three days.

From the Horticultural Magazine.

ON THE CULTIVATION OF THE HYDRANGEA, (H. HORTENSIS.) BY THE CONDUCTOR.

This very showy and highly ornamental plant, though it has long been cultivated, is far from being very common. Indeed fine specimens are not often seen, and we may infer that the want of better information in regard to their cultivation is one cause why they are not grown to greater perfection.—The peculiar soil which they delight to grow in, and in which alone they ever flourish successfully, is not always to be conveniently found; recourse is consequently had to the common earth of the garden, in which they grow tolerably well for a little while, but finally dwindle away and die. Persons unacquainted with the plants, at all, are apt to kill them immediately; having a desire to enrich the soil, manure is added, which is sure death to them. The following few hints may be therefore of some service to our readers.

Hydrangeas are cultivated by layers and by cuttings; the former make the largest plants in the shortest period of time, but the latter method is the most convenient, and the plants are handsomer shaped. To propagate by layers, all that is necessary is to plunge the plant in the garden, or turn it out into the soil, and place round it some suitable earth; then make a slit in the shoots, longitudinally through a bud, and peg them into the soil, covering them over an inch or two in depth. The operation may be done either before or after the plants expand their blossoms; in either case they will generally root very easily. To propagate the plants by cutting, the shoots should be taken off in the spring, about a fortnight previous to the breaking of the buds, just as they begin to swell, or in the fall, two or three weeks after they have finished their summer's growth, and the wood begins to harden. The former season may be chosen to procure flowering plants of a small size, but the latter should be preferred where the object is only to get plants, without any regard to their early blooming. Cultivators who put in cuttings in the spriug go over the old plants and select such shoots, as, from their swelled appearance and firm feeling, they judge will throw out flower-buds; these are cut off below a bud, with from one or three inches of the wood, and are inserted singly in small pots, and plunged in a gentle bottom heat, and shaded from the rays of the hot sun; they soon emit roots, and they are then shifted into the next size pots, (No. 2.) in which they generally produce a fine large umbel of flowers. Plants thus treated have a very pretty appearance, the flowers sometimes being three times the size of the pots they are growing in. This mode may be adopted with amateurs, but is attended with more care than that of taking off the cuttings in the autumn.

After the summer shoots have acquired some solidity, and begin to assume a slightly brownish tinge, cut off the ends of as many as there are plants wanted; let them be about four inches long, and contain six leaves; be careful that they are cut across, directly under a bud; trim off the two lower leaves, and insert each cutting in a No. 1 pot. Place them in a frame or against a north wall, where they will be shaded from the sun for a month; by the end of this period they will have made sufficient roots to be removed to a warmer situation, where they may remain until severe frosty weather, when they must be taken into the greenhouse frame, or, in want of either of these, the celler. The soil in either of these modes should be composed of peat or leaf mould, with the addition of about one-third sand.—Out of twenty-five cuttings, the most we ever put in at any one time, not one failed to grow treated in this manner.

The after management of the plants is very simple; the following season they should be shifted into No. 2 pots; and, as they continue to grow, they will require larger ones, until they reach such a size as to need large tubs. The soil should be peat, from low situations, or bog earth, or, if these cannot be procured, leaf mould. Give a good drainage to the pots, as stagnant water is injurious to the roots. When the plants come into bloom, keep them well saturated with water, and let them stand in situations where the sun shines only a few hours in the morning. The proper season for potting is early in March, just before the plants begin to grow.

Much has been written respecting the cause of the flowers sometimes opening blue and at others red, various modes have been recommended to make the plants produce those of the latter color. Bog earth, loam, and saturating the plants with water, in which iron filings have been steeped, have each been tried, to produce the effect, and each have answered as well as failed to do so.—That it is owing to the presence of oxide of iron in the soil we have no doubt; and when bog earth or loam can be procured of the right kind, the color will be changed. This we know to be the fact. A few years since we tried the experiment upon a plant; it was an old one, and was separated so as to make two; one was planted in bog earth, and the other in a hazel colored loam: the flowers of the one in the bog earth were red, and on the other, in loam, were of a more intense blue than any we have over seen since.—Cuttings that we have raised and planted in the same loam have flowered blue. There are, perhaps, few soils that possess this property, but when one is found a stock of it should be secured, if blue flowers are desired; the plants do not, however, grow so vigorously as in bog earth. It is a good plan to grow the plants a year or two in loam, and then shift them into the bog earth; but it must be remembered that the latter soil will sometimes produce blue flowers.

Hydrangeas should then be in every garden: the long period which their flowers remain in perfection, and the care with which

they are grown, should entitle them to the notice of every lover of flowers.

[This article was written to appear last autumn, but was laid aside to accommodate our correspondents.]

SHEEP HUSBANDRY.

Extract of a letter from a subscriber in Maryland to the Editor of the Genesee Farmer:

"While I have my pen in hand, it may not be amiss to give you a brief account of the very handsome profits which I have realized from a small flock of sheep during the past year. When I came into possession of my farm a short time since, I found on it twenty ewes of a very indifferent breed, and of that breed not the best in age, size, or in any other respect. They were fed during the last winter on corn fodder, with the addition of turnips for a few days about the time of yeaning. After this, (the early part of March) they received no food except what they could find for themselves in the fileds. These sheep, thus treated, yielded an interest during the following summer, of 87 per cent., on the sum for which they could have been readily purchased the preceding fall, as follows:

20 Ewes at $5	$100 00
22 Lambs at $3	66 00
50lbs. of wool at 42 cts.	21 00
	$187 00

It is maintained by some writers in Agricultural papers that the manure of this animal is a full equivalent for all the food which it consumes; but supposing this to be an exaggerated estimate, and that the manure of this number of sheep during a year would be less in value than their food by $50, still there is a nett interest of 37 per cent.

Is it not surprising, and much to our discredit too, that when such are the profits of sheep husbandry, we should import such large quantities of wool? and also that persons should leave their pleasant homes in the Northern and Middle States, for the wilderness of the "West?"

GOOD ADVICE TO A FARMER.

"Many years ago," said a quaker friend who told us the following anecdote, "many years ago, a brother of the celebrated Benjamin West, who had been a cooper in this city, a man of sterling sense and integrity, purchased a farm some miles out of the city which had been suffered to be overrun with briars and bushes. He was for a short time considered by his neighbor farmers as very far from being as wise as Solomon or even themselves, but in a few years his was the best and most productive farm within fifty miles around him and his fame as a farmer spread far and wide. One day a man came to him who was desirous of improving his farm, and asked him how he should do it. Go home, said Mr. West, and mske five or ten acres as rich as thee wants, and come to me and I will tell the what to do next. But, said the farmer, I have not manure enough to do that. Very well then, go and prepare three acres, two acres, or one acre in the same way, but what thee undertakes, do well. The farmer, said our friend, perfectly comprehended the advice, and what is unusual, practised upon and benefitted by it, leaving at his death, one of the best farms in the country." Go and do thou likewise. —[Phil. Herald.]

ADDRESS BEFORE THE ESSEX AGRICULTURAL SOCIETY, SEPT. 28, 1836. BY NATHAN W. HAZEN.

We have received an address delivered in September last by N. W. Hazen at the Annual Cattle Show of the Essex Agricultural Society in Massachusetts, which we shall with pleasure lay before our readers. The Essex Society of whose reports we have often availed ourselves, stands in the front rank of the Agricultural Societies of the Country for its useful publications and improvements. No Society in the country has done more; few have done so much; and it is only to be lamented that their useful example should not be followed by a more spirited emulation. The address has anticipated the appearance of their Annual Reports, of which it usually forms a part. The reports, as soon as received, we shall have much gratification in laying before the agricultural public.

Mr. Hazen's address is sensible and useful; and is entitled to great credit for the neatness and perspecuity of its style. It contains many excellent suggestions; we may dissent from some of the opinions expressed; but we shall not dissent without a perfect accordance of the right of private judgment even to those, from whom on any subject we most differ. If there were no difference of opinion there would be no discussion; and without discussion, the entrenchment of error would remain impregnable, and the progress of truth be essentially, if not utterly, impeded.

Mr. Hazen details some striking facts in respects to the importations of bread stuffs into New-England from various other States, when she ought to be able in this matter from her own resources to supply her own wants. We believe that New-England, if not capable of doing this completely, may yet nearly approach a perfect supply of her necessities. Her cultivation compared with the increase of her population, is unquestionably on the decline. It would be of the highest importance to her as a community, if her resources and capacities in this matter could be ascertained and made known. It would be of much greater importance to her in respect to morals than any extraordinary increase of wealth from other sources can be in other respects, that this subject should engage the serious attention of her young men; and that sufficient inducements could be found for them to remain at home; and engage in the honorable, useful, and independent pursuits of agriculture. But how this is to be done while the fever of sudden acquisition is so universal and epidemic; and the pecuniary returns of all mechanical and manufacturing employments and of commercial pursuits likewise so much exceed those derived from agriculture, it is difficult to say. It is however, particularly desirable to show that agriculture in New-England is by no means a losing concern; but that, well conducted, it is sure to afford all reasonable and a certain reward for labor; that under an improved agriculture its gains might be expected to be more than double; and above all, that its gains are always honest gains; and that its labors pursued with due diligence, discretion and frugality, are almost secure of a competence, and an honorable independence.

In speaking of the improved Argiculture of Great Britain, Mr. Hazen remarks; "How wonderful is the spectacle, when having provided for her own consumption, we see that narrow island, loaded and crowded with its millions, excelling the world in arts and commerce, importing from the stores of its abundant fertility, grain for the food of the people scattered over this broad continent." And in another place he remarks, "We are told that arrangements have already been made for importing in the present year fifty thousand bushels of wheat from the single port of Liverpool, &c." We apprehend it will be found a mistake to suppose that the wheat imported into this country from England is grown in that country. The wheat referred to, (and the importations into this country from the European Continent will fully realize the expectations that have been formed,) was no doubt German or Polish wheat; or it may be wheat from ports in the Mediterranean, first imported into England and there remaining in the public warehouses under bond. The cultivation in England is indeed carried to an extraordinary perfection; but England has no bread stuff to export. She has an immense population, withdrawn from the labors of agriculture, who are to be supported; and it seldom happens that she has not many more mouths to be filled than bread to fill them with. England protects her agricultural interests by severe corn laws, imposing very heavy dutics on foreign wheat and flour, which amount indeed to an absolute prohibition, until the price of wheat in the home market reaches a certain point; and then the ports are thrown open to the admission of foreign wheat and flour; and vast amounts, which remain under bond in their public warehouses, are then brought into market. Large amounts of wheat of the finest description from the Black Sea have been brought into Boston this very season by importation from London, where it

was laying in bond. It is a melancholy anomaly in the political condition of this great and prosperous country, that in the midst of her extraordinary wealth and prosperity so large a portion of her population should be famished for bread. There were imported into England the last year from Ireland alone, of wheat 3,697,832 bushels, and of meal and flour 1,100,463 quarters; and into the Isle of Man, of wheat 151.968 bushels; certainly an immense amount to be drained from a country, where those, who raise the wheat, are compelled to subsist mainly on potatoes.

In comparing English Agriculture with our own, many things are to be taken into consideration; and a system of cultivation which might be highly eligible in that country, would work very badly in this. Labor in England is usually not a third of the price of labor in this country; and heretofore the prices of Agricultural produce in Great Britain have been enormous. At present they are much reduced, and the landed interest are complaining of ruinous depression. The labor bestowed in their cultivation in England is vastly greater than in this country; and their returns in general are greater. We have the advantage of them in the cheapness and in the newness of much of our land. They have greatly the advantage of us in their exactness and system, which pervade all their operations. They lose nothing; they waste nothing,—our farming in general is extremely hurried, slovenly, and wasteful.—They have a great advantage over us in the power of procuring any amount of labor at any time when needed; and in availing themselves of the services of women and children, who in many cases perform the work of men, at much less wages, and less expense of board. No such service is known among us. Indeed the exempts from all labor in our community is a very numerous class, and constantly increasing, to the great injury of the community.—Labor with us is daily becoming more difficult to be procured, and few farmers in the country are so situated, that they can obtain any amount needed at pleasure, on any sudden emergency. With them labor is furnished at pleasure as matter of necessity; and as a favor to the poor to be employed. We have in truth no such class of poor in this country; and with us labor is bestowed on the employer as matter of condescension and favor. In that country no man undertakes to carry on a farm without a fixed capital; and of such an amount as will enable him to apply whatever amount of manure or labor he may deem necessary, and pay all the current demands of the farm for the year; and to hold his crops until they can be sold to advantage. I fear the reverse of all this is in general the case in this country. Without capital a farm can no more be managed to advantage than a manufactory or a voyage.

The remarks of Mr. Hazen on the proper size of farms need much qualification. We agree with him that a farm is too large for the owner, which he has not either the capacity, or capital, or disposition, to manage and husband as it should be done; that a small amount of land highly cultivated, is better than a large amount poorly cultivated; though where land is as cheap and labor as dear, as it is in this country, it is by no means always the most profitable mode, though far the most satisfactory mode of cultivation; but the proper size of a farm can be determined only by considering it relatively to its situation, the character and condition of its soil, the kind of husbandry for which it is designed, the labor attainable, and the capital to be employed in its cultivation. Farming in general in New-England seems to be pursued only as subsidiary to something else; or some trade or profession is deemed necessary to eke out its products. We do not refer to these cases, which must be regulated by peculiar circumstances; but where farming is an endusive pursuit, and pursued with a view to profit, the farm ought to be large enough to occupy all the superintendence, labor, and capital which the proprietor can apply to it; and the character of the cultivation suited to the kind of crops raised; always deeming those the best crops, which best compensate the labor of cultivation; and that the best cultivation, which causes the greatest product.

H. C.

We subjoin the address itself.

ADDRESS.

Mr. President and Gentlemen,

Whatever praises may be offered to Agriculture, there are some indications that it is not at this time the favorite pursuit in New-England. Many farmers, especially those who enjoy a competency, do not choose it for their children. Many of those who have been bred to it, seize the earliest opportunity for engaging in other pursuits. Others who are contented with it as a vocation prefer to follow it in the praries of the West, rather than on their native hills.—There is a burning anxiety for distinction, and a feverish thirst for money, which scorn the old, beaten and approved paths to wealth and consideration. The quiet usefulness of the farmer is falsely thought to be thrown into the shade by the tinsel of professional life, and the delusive, and now prevalent spirit of speculation contemns his gains as trifling, and his occupation as tame and unenterprising. Whatever may be said of the pleasures and importance of Agriculture, it is practically considered that it does not offer the readiest way to the fulfilment of those hopes in which youth is now taught to indulge, and if not actually an impediment, that it is not the best help to that distinction which it is the right of one as much as of another to acquire. The opinion still prevails that there is an advantage from profession that is independent of effort, and of personal character and qualification.

As some proof that such a disposition exists, and to illustrate its consequences, it may be remarked that the agricultural products of New-England have been for some years falling short of the demands of the population, and that the increasing deficiency has been supplied from the South and West. There are some facts which show in a striking manner the extent to which this supply has been already furnished. Two years since it was ascertained that nearly three thousand barrels of flour were carried to one of the largest agricultural towns in this county, for the consumption of its inhabitants. An intelligent and extensive trader in the interior of the State of Maine, and not in the vicinity of any considerable lumber district, estimates that he sold flour, the last season, to as large an amount as he received of cash for his whole sales. Beef and pork packed in Ohio, have been freighted through the Notch of the White Mountains to the fertile intervales that lie towards the head of the Connecticut. Within a few years a mercantile house in in Boston purchased in a single season, from the county of Worcester, nearly two million pounds of pork, the growth and produce of that county; and the same house is now employed in obtaining the same article of provision from the West, to sell for consumption in that very county. The last year, a season by no means of uncommon scarcity, commenced the importation of breadstuffs to this country from the old and populous nations of Europe. We are told that arrangements have already been made for importing in the present year fifty thousand bushels of wheat from the single port of Liverpool, and we are promised that these importations will be made upon such terms as to reduce materially the present prices. It is no less remarkable, and no less illustrative of the degree to which agriculture has fallen behind other pursuits, that neither the increased demand, nor the high prices of produce, have had much, if any, effect on the value of lands for culture, and that farms were never or seldom of more difficult sale than at present.

Without doubt this state of things may be attributed to various causes. It is proof however, either that a smaller proportion of the population is engaged in agriculture than formerly, or that agriculture itself is less productive; that in the progress of society other pursuits have gone in advance of this, and that it can no longer be depended upon for the supply of those wants to which within a very few years it was more than adequate. Adapted as is agriculture to the nature of our civil institutions, and the nurse as it has been of much of that high moral character for which New-England has been honored; important as its interests must ever be in

any community, its loss of even equal comparative advancement cannot be witnessed without deep concern. Indeed the present state of things can hardly be of long continuance. Any one of the thousand changes constantly occurring in the political world might at once and wholly alter their condition. The country is essentially agricultural, and without any contingency, it may well be doubted whether it can in the long run any better afford to buy its provision from foreign nations than the farmer can afford to own a farm, and without other resources to more than half the expense of of his maintenance, purchase from his neighbors the very things which his own land ought to supply, and if cultivated, would yield.

All other occupations are prosecuted at great comparative risk. The business of farming in New-England has always had the advantage of great certainty. The very hardness of the cultivation has exacted great prudence in the expenditure, and its gains have been too small to tempt the cupidity of capitalists. But there are abundant proofs now before us, that it has not left industry, sagacity and skill, when applied to its service, unrewarded. Well directed and persevering efforts have been crowned with success alike profitable and honorable to their author. No where else has the fortune of the man been so entirely in his own hands, and by no other path has the attainment of independence been so free from fatal contingences. No other class of men can reckon in their ranks so many instances of success. And when prosperity comes to the farmer it proceeds from no doubtful agency. There have been those who in other pursuits have amassed larger fortunes than Agriculture confers; but Agriculture, if we appeal to no higher authority, will assure us that all the gifts of fortune, beyond what itself bestows, are incumbered with vexation, or but minister to vanity. In the other classes of the community, the farmer sees as it were the vision of Mirza. "He beholds many in pursuit of the bubbles that glitter and dance before them" until they tread upon some hidden danger "through which they fall into the pit, and immediately disappear." But if a farmer is unthrifty, the progress of his decay is marked on his possessions; these for years tell the story of his decline to every passenger. In such instances, there have commonly been defects in the character of the proprietor which would much earlier have set the seal of ruin upon him in any other vocation. There is probably no occupation which in the aggregate has added more to the general wealth, and which has so surely led to competency in manhood and to ease in old age. A business which is attended with such results cannot reasonably be suffered to decline because it is not sufficiently profitable; for where it is safe to calculate so much, superior sagacity and enterprise may accomplish much more. This pursuit will always retain the advantage which it may justly claim form its certainty. In some seasons, drought, excessive rains, insects or frost, may diminish or perhaps cut off the expected crop. The vicissitudes of wet and dry injure some lands, and benefit others. Frosts and insects are the only fatal and unsparing enemies from whose visitation no good comes to any. But the scarcity of one crop is supplied by the fullness of another, or the abundance of one year compensates the deficiency of another, so that an average of any five or ten years will not leave much difference of profits. The surplus may sometimes be large, and sometimes perhaps nothing may be left after paying the expenses of cultivation and providing for the support of the family. Still in the productions of the farm are found a very large proportion of those things, the purchase of which constitutes the expense of living. This advantage cannot be impaired by the numbers who are competitors. But as speculations or speculators multiply, their chances of success must be diminished. As the ranks of the professions are swelled, support must become more precarious. As the numbers of the mechanics and manufacturers become disproportionate to those of the rest of the community, their profits will be decreased,—besides their constant dependance on the state of trade and the general prosperity. The very deriliction of husbandry, and the reliance of so many upon other occupations, have a tendency to increase their risks. When these chances of failure are better appreciated, when the flattering hopes, that lead men into other paths, have ended in disappointment, they will seek safety, and even repose in the labors of agriculture.

But if these have a tendency to limit success, to leave the mind unoccupied and unexercised, to prevent the attainment of any elevation of character, then certainly the period and state of things, which would turn men back to them, should be met with regret instead of exultation. The causes of such effects, if such there be, must be sought in the circumstances of cultivation, such were the purposes of nature. We cannot overlook that adaptation of all created things to the ends for which they were designed, so complete that we cheerfully rely upon it as conclusive proof of the greatest of all truths, the existence of an Infinite Creator. He created the plants of the earth, and man with all his faculties, and "made them crescive in their quality." He ordained the plants and the minds of men to grow by man's cultivation. The culture of the understanding and of the fruits of the earth, are equally duties, though perhaps not in equal degree; and the proper performance of the one cannot be presumed inconsistent with the due discharge of the other. It cannot be supposed that man has been created with an inevitable necessity of engaging in labors not compatible with the growth and exercise of the higher attributes of his nature. If he has been designed for such employments, they are fitted to man as he is—a being possessed of reason and affections intended to be strengthened and purified, elevated and enlightened, through a progress of illimitable perfection. Agriculture cannot be intended to check, but rather to facilitate this progress. Rightly practised, it must tend to accomplish in man the purposes of his creation. It is true that as governments have been commonly framed and administered for the benefit of the few, and against the rights of the many, the agricultural classes, owing to a variety of causes, have usually been those from whose oppression the means of supporting this order of things have been drawn. In their scattered dwellings, in ignorance, and with no means of acquiring kowledge, in constant view of an entire equality of wretchedness among all who labor; with no extensive intercourse, even among their own class, and without concert, it has been easy to maintain unequal laws over them, without much apprehension of resistance. It has therefore been the effect of most political institutions to depress this interest into a state of subordination and vassalage, so that it might be wielded without any will of its own, as the interest or ambition of the more favored class, called the State, should dictate. Such is now the debased condition of the laboring classes of Europe. Not content in general with drawing from their earnings, what may be required to support the luxury of their landlords, precautions have been taken to prevent the laborer, though he may sometimes a little influence his condition, from rising above it into another sphere. The laborer has no share of political influence; no participation of political power, and by the attempt to exercise any, he would in most countries incur the guilt of treason.

The same classes which in other governments are thus proscribed, are here the depositories of all political power. They are in any sense of fact or theory, THE PEOPLE. On their moral and intellectual character depend the honor and prosperity of the nation. These require that their ranks should be full of those who understand the trusts reposed on them, and in those ranks should be found such inducements as will engage the affections, and animate the hopes of youth. They should be able to discover in them their way to that estimation and respect, of which it should be the object of all education to make them seek to be worthy. When agriculture loses the services of youth, and they desert its fields for other employments, it is as though spring should be struck from the seasons of the year, or should forget to bloom.

In order to this, the spirit of improvement which is diffusing itself so largely into every other department of life, should in this be animated. If the agricultural products of Europe are now to be met in our own market, the competition must be met with new efforts, or the agriculture of our country will still more decline.

If the whole population of the Union should be collected upon New-England, if her commerce and manufactures were then to be increased in still greater proportion than this increase of the population, from what shores, and by what navies should the provisions for her supply be freighted? England, on an extent of territory considerably less than that of New-England, contains a population equal to that of the whole United States at the last census. Yet such is her confidence in the resources and products of her own agriculture, that the importation of all such articles as they can supply is restrained. How wonderful is the spectacle, when having provided for her own consumption, we see that narrow island, loaded and crowded with its millions, excel-

ling the world in arts and commerce, imparting from the stores of its abundant fertility, grain for the food of the people scattered over this broad continent. What an illustration is this of what agriculture may be made to accomplish! Yet all the improvements, that have made the agriculture of that country so prodvctive, date back to a period little beyond the last half century. Before this time land was looked upon as a source of power, rather than of revenue. The object of cultivation was a mere and a very wretched subsistence. The only modes of cultivation were those which descended, like their religion and their laws, from their ancestors. Such however, since that time, has been the progress of improvement, it is now doubtful, whether with all the advantages of labor saving machinery, the advances made in manufactures have much exceeded those made in agriculture. In the meantime the increase of her population has only been equalled by that of the United States. The stock to be maintained from the products of the soil has multiplied in a still greater ratio. A greater luxuriance in the productions of the earth, the fruit of a richer culture, has added to the size and improved the symmetry of the domestic animals. At the beginning of the last century, the average gross weight of the cattle brought to the market in Smithfield, did not exceed three hundred and seventy pounds, and that of sheep, twenty-eight pounds; the present average weight of cattle in the same market, is eight hundred pounds, and of sheep eighty pounds. And the limits of improvement are by no means supposed to be attained. It is the opinion of practical men best acquainted with the subject, that the raw produce of the Island might well night be doubled, without any greater proportional expense being incurred in the production.*

Previous to 1793 no improvements had been made in the agriculture of Scotland. There was no rotation of crops; fallows were unknown; the process and the implements were alike wretched; neither turnips, clover or potatoes had been so much as heard of, but corn followed corn in unbroken succession.† To introduce the new systems, which have been attended with so much improvement, has been the work of a few names as well entitled to the memery and honors of posterity, as any that are borne on the pages of history. It will be the dawn of a brighter day to this interest, when more adequate justice is done by public opinion to the merits and services of its benefactors. The title of Father of Scottish Agriculture, conferred on William Dawson, was an expression of public gratitude scarcely less honorable to his countrymen than to him. By the system of culture which he introduced, the production has grown to be twelve times greater than formerly, while the fertility of the soil is kept up with a proportionate increase of profits.

We thus see that in Great Britain agriculture has furnished hands for the labors of anufactures, ond has then run with them an equal race. There manufactures have been multiplying, and villages springing into existence in the same manner as in our own vicinity. The land has there been tasked to equal the produce to the demands, however large they might be. Something approaching to the same effect may here be witnessed in the immediate neighborhood of manufacturing settlements. They have encouraged farming by creating a demand, and providing a ready market for its products. Still even in these districts the supply is very deficient and the prices high. If hitherto manufactures have nourished agriculture, it cannot be told how soon manufactures may seek a return of the benefit, in the form of a more abundant and cheaper supply.

The example of England teaches what may be effected by systematic and scientific modes of cultivation. So far that country furnishes a model for imitation, and no farther. Better would it be that our agriculture should retrograde an hundred years, than that any conceivable improvement in it should be purchased by the adoption of the policy of that country, under which this increase of production has been effected. The landlords grasp all the profits, and amid this immense accession of national wealth, the laborer, who has earned it all, receives only the boon of the exchange of wheat bread instead of rye. An increasing family, sickness or old age write his name on the list of paupers.

It is true that the agricultural improvements made in Great Britain have been effected under commercial regulations directly designed for their encouragement. The tenure of lands has enabled one hand to grasp the profits of many. By these and other means the price of land has been kept so high that no man, not already in the possession of riches, could purchase, and so many have been in this situation, with no dependence but their labor, that they have been obliged to work on such terms as the landholders imposed. In this manner to the rich has been applied the stimulus of large gains, and to the poor that of unbending necessity. The rich have made farming a study, and applied to its management the rules and principles of science. The labors of the tenant have received direction from the studied skill and scientific knowledge of the landlord.

We learn from this that there is an art in this business, and that science may be of the greatest advantage in its direction. Within the fifty years preceding 1814, about 500 volumes were published in that country on agricultural subjects, and the titles of books appearing in the quarterly lists of new publications since that time would seem to indicate that the annual numbers have increased. This contrasts strongly with the small catalogue hitherto published in the United States upon similar subjects, as contained in your pamphlet of 1834.

In New-England the landholders and the laborer are united in the same person; and in order to the highest improvement of agriculture, he should combine the industry of the British laborer, which he already possesses, and the philosophy of the British landlord, of which it is to be feared he is sometimes deficient. In this mode only can it be practically elevated to the rank of a science; and by this mode the example of England teaches us that labor may be facilitated, products increased in amount and value, and new worth given to land.

It is admitted, indeed it is enforced as a truth necessary to be understood, that all our other institutions call for the exercise of mind, and in most others a part of the fruits of success will be some degree of intellectual distinction. Agriculture has often been supposed to be a trade which a man might follow without much, if any previous training, in which success depended on the bones and sinews alone, and in its pursuit knowledge, beyond a very limited extent, would be useless. That however widely or brightly the rays of science might shine, into this broad department of human life, they need not, and could not, penetrate. Perhaps it has been owing, in no small degree, to opinions like these, that this avocation has lost some of the favor which it enjoyed. If it were once well established that it affords a field for mental effort, the mind would here seek for distinction. It would then be a part of the business of the farmer to cultivate precisely the same faculties, and to exercise the same powers of mind that in other lines of life lead to elevation. The effects of such a conviction would be alike favorable to the general interests of husbandry, and beneficial to the character of the cultivators.

There are some indications that the old and indiscriminating hostility to the use of books is passing away, and that a more favorable disposition to listen to them is taking its place. The general principles of agriculture may certainly be learned from books, and indeed many of them are to be learned only from books or from instruction. Hardly any individual observation could be sufficient to establish them. Still there are farmers, who even at this day do not supply themselves with a large amount of reading upon these subjects. It will never be fancied that the mere reading of books can make a farmer; although one who reads books without any practice, may be as well entitled to be called a farmer in any sense of merit or praise, as one who is commencing cultivation, but never reads upon the subject of his labors. If it be true that agriculture is the most important of all interests, how does it happen that it can derive no aid from the recorded lessons of wisdom and the testimonies of experience? It is easy to account for the prejudice which often shuts it from such aid. The practice of the particular neighborhood is early learned by imitation, and as much observation, as would serve for this purpose, has been the whole agricultural education of youth. The prevalent practices just serve for the purposes of life, and it seems irrational to be called to the study of the theory, when one has advanced beyond that, to a thorough acquaintance with all the practices, in the narrow circle of his information, known to exist. But the practice thus learned may be neither the easiest, cheapest, or most productive. A few hours reading might suggest some improvement, that would greatly abridge the labor and increase its profits. Reading should not supplant labor, and labor need not sudplant reading; they should mutually relieve and enlighten each other. Agricultural books should make a part of the property, and agricultural reading a part of the business of the farmer. It would be easy

* Edinburgh Review, No. 126.
† Edinburgh Review.

for him to give his children and apprentices a taste for the knowledge thus to be obtained, and a sense of its importance, by pointing them occasionally to the various modes of cultivation described in the books, or contrasting them with those practised by himself. By such a union of practice and reading, this pursuit is brought into a close resemblance with those deemed the exclusively intellectual. The farmer in such inquiries does precisely what is done by the professional man. He ascertains facts, weighs testimony, analyses the opposing statements and reasons, and finally applies in practice the truth elicited to the state of facts presented by his own farm.*

The practicability of combining theoretical knowledge with a practical, vigorous and successful cultivation is not an experiment of doubtful results, nor one which remains to be tested in this Society. Its records furnish examples derived from every town in the county, of persons of the highest respectability, of the greatest weight in the community, and of the best talents in the highest cultivation, combined with an invigorating devotion to the daily labors of the field. The object to be gained, is to spread the influence of such examples, and to impress on the whole farming community the truth that the same means of elevation are open to every farmer, and that the use of them stands inscribed high on the catalogue of his duties. If nothing is to be gained by the study of agriculture, then certainly the writing of books, and the preparation of reports are quite useless; and their authors not only misspend their own time and labor, but they may be the occasion of a far greater waste in the community. Writing and printing are mere ostentation and vanity, if the matter is to end here, and here it is to end, unless what has been published is to be taken up, considered, re-considered, and permitted to influence and guide the practical farmer. To what end was it, that your lamented President, the venerable Pickering, gave his last days and the full ripeness of his wisdom to recording for your use the fruits of his long experience and acute observation. His knowledge, while it embraced all the practical details of husbandry, comprehended also the whole of its philosophy. Whether he wrote upon the culture of Indian corn, or the more abstruse theme of the food of plants, he was equally clear, precise and practical. His political labors and honors may be forgotten, when his services to agriculture shall be freshly remembered with increased respect and warmer gratitude.

In the Address delivered before you at your last anniversary, it is stated to be "a great object of the farmer to obtain the most valuable produce, with the least possible labor, and at the same time to keep his farm in a state of progressive improvement." What are the requisites to the accomplishment of this truly great object? What profession requires the combination of more skill, knowledge, calculation and perseverance? If he would obtain the most valuable productions, he must be acquainted with all productions, their modes of culture, and all the improvements made in those modes in all parts of the world. But this knowledge may only mislead him, unless he is also acquainted with all the circumstances and peculiarities of soil, climate and situation, in order to understand whether the products or modes of culture are adapted to his own farm. How much knowledge, embracing how many subjects; how much skill and calculation are required in order "to obtain the largest produce with the least possible labor?" And all this not only without exhausting, but on the contrary, increasing the fertility and productiveness of his farm?

If a farmer subjects his lands to an unvarying routine of crops; if he ploughs a field merely because it has run out, and he knows no other means of renovation; if he lays it down again, merely because it has been ploughed and tilled just the number of seasons that he ploughs and tills all his lands, without the smallest reference to varieties of soil and situation, will be likely "to obtain the most valuable products with the least possible labor, and to keep his farm in a state of as great progressive improvement," as would be effected by a more various and intelligent course of husbandry? If such a mode requires more labor than another that might be adopted, does he not lose the profit and advantage that might have been derived from that excess of labor otherwise bestowed? Labor is a part of the capital of the farmer, and his employment of it will determine the measure of his prosperity. It is the object of all practical science, and in all arts, to increase the products of this capital. Much of the business of the manufacturer consists in giving to labor its utmost possible effect. The wonderful results of labor saving machinery, whose operation he constantly witnesses, impress this principle of economy strongly upon his mind, and to its application to his own business he is always bending his care and invention. It is no less important to the farmer; and he who brings to the subject the most ingenuity, and gives to it the most thought, will be best able to appreciate its advantages, while in the consequent prosperity he will reap his ample reward. Much to this end may be accomplished by the skilful construction and arrangement of farm buildings and fences; much by the plan, order and season of labor; much by the mode of the performance of the work, and much by the judicious selection and adaptation of seeds, implements, manures and animal strength. In short every movement on the farm, whether of permanent arrangement, or of daily labor, is, in this respect, a matter of gain or loss. Whatever can be accomplished in this way towards diminishing the charges of production, is so much added to the profits of the business. All such intellectual and mechanical contrivances which lessen the amount and expense of labor, are as necessary and as much superior in point of public utility to the same improvements in manufactures, as the objects of their production are more necessary.

One of the first results that will spring from the adoption of more scientific views, will be greater system in the management of farms. Your attention was called on a former anniversary to the deficiences arising from a want of system.* It has been said that there is no business so made up of minute details as that of the farmer, and it is always mentioned as one of the inevitable disadvantages to which agriculture is subjected, that it does not admit of those divisions of labor, which so much facilitate manufactures.

It is obvious that the greater is the number of circumstances incidental to an occupation, the stronger is the necessity for their reduction to the best possible method and order; and the less chance there is for a division of labor, the more regularity should there be in the order in which its details are committed to the hands of the operator.

The adoption of system in husbandry is apt to induce that minute attention and close observation on which its success so much depends. Every thing in its turn and degree will then receive the care and attention which are its due. The profits of nearly all business are made up from small gains and savings, the fruits at once of frugality and vigilance. These are the life blood of agriculture. If they are wasted, its vigor soon feels the decay; its resources become exhausted; the means of improved and extended cultivation fail; industry seems fruitless; labor finds only half its returns; the farmer has reached the meridian of his years; independence and ease still lie at a distance before him; he sees the infirmities of age waiting to beset him on the way; he loses the animation of hope and sinks into the perplexed and negligent husbandman. Such doubtless is the history of many a farm and many a farmer, who needed nothing but a systematic beginning to have brought the one early to fertility, and the other to independence.

The proper size of farms has been the subject of much discussion. The opinion that in New-England they are too large, seems to be very uniform. The fact thus indicated cannot but be greatly prejudicial to the interests of agriculture; and the evil would certainly be reformed if the business should be subjected to more accurate calculation. Should a merchant plan his vessel so large, and exhaust so much of his resources on the hull, that he could furnish her with no more sails and rigging than were suited to a much smaller vessel, could only half fill her with freight, and must then send her to sea half victualled and half manned; or if we should see a whale ship with all her appointments sent on a voyage for mackerel, it would need no argument to convince us of the folly of the projectors. But do not these instances fairly illustrate the conduct of the farmer who persists in holding an extent of land under the forms of cultivation, over which he may indeed make his annual pilgrimages in careful search after the scanty and timid crops; around and about which the fences are attenuated and stretched until their existence becomes a problem, and whose whole culture, with whatever industry it may be prosecuted by its owner and such aid as his narrow means enable him to obtain, is but a manifestation of the willingness of the spirit and the weakness of the flesh! Land and wealth are often associated in idea,

* In some of the States, especially the Western, agricultural books and papers compose a part of the premiums offered.

* Address of Hon James H Duncan, 1830—p. 19

and it is overlooked that land is only the means of wealth when it is made the source of rent, or when it is made productive. If more is held than is made profitable by its annual rent, or produce, the interest of its cost, its fencing and the taxes upon it are charges upon the farmer; and the price paid for it is so much deducted from the amount of money that he might otherwise employ in the superior cultivation and improvement of a smaller farm.

Some of the considerations that should determine the size of the farm are very obvious. It should bear a just prportion to the means of cultivation that will be possessed.* The owner should be able to extend to every acre of it that degree of cultivation which subjects the soil completely to the purposes of man. Over his territory he should no where hold a divided empire with bushes, with exhaustion, unruly cattle, or mortgages. It should not be so large as to require more experience and skill than the owner will possess for its management, and its extent should not be such that its proper conduct will involve more business, and require more calculation than the talents and capacity of the proprietor can accomplish. Its size should in all respects be so much within his circumstances that it should in some degree impose upon him the necessity of a thorough cultivation. It should be such that he may not look for sustenance from the merely natural growth of the surface, but it should be such that he may feel the necessity for using some labor, and some art to increase the powers of production. The chief idea of agriculture in the Netherlands, where it is carried to so great perfection is, "to make the farm as nearly resemble a garden as possible." The adoption of a principle like this at the first setting out leads them to undertake the culture of small estates only. They have learned from experience, that ten acres under a good cultivation are worth more than forty under one that is deficient. The consequence has been that such is the skill with which farmers cultivate even a bad soil, they they compel it to return them a produce which the strongest and richest lands of the neighboring province of Holland refuse to yield to less judicious management.

Few subjects require more accurate calculation than those which belong to the economy of agriculture. The readers of the New-England Farmer, and there probably are few members of this Society, who do not come within that description, will recollect a paragraph contained in that paper a few weeks since, stating the result of a calculation that had been made between having bars, or a gate for our inclosure, by which it was proved that if the bars were to be taken down once a day for one year, the difference in time would pay for three gates. This is a specimen of the computations that are to be made under this head. They are not questions of mere curiosity but they result in realities of profit or loss. Suppose also the instance of a plough: it will last several years, but it is of inferior construction, will not do good work, and requires the application of more strength than another that might be obtained. Shall he continue to use it, or shall it be disposed of at any sacrifice? Without a knowledge of the structure of ploughs, and without a practised judgment, the farmer may never discover its defects, or should he make the discovery and attempt an exchange, he may obtain another just as defective. Without information he will not know the latest improvements. In, order to decide correctly he should understand precisely the defects of the old implement, what change in its construction would adapt it to his own land, and the comparative advantages of a new one, and the expense of an exchange. If he means to conduct his business with certainty he will make these caculations, and not leave the resu t to time and chance; to the time when *by chance* he may bargain with a neighbor for a plough still worse perhaps than his own, or until it is worn out; and to the chance that it may require extra labor equal to the whole amount of what would otherwise have been his clear profits, —and effecting in the end a diminution of his property to many times its value. The manufacturer rejects, with a moment's hesitation, machinery found to be defective, and supplies its place by the best that can be fabricated.

Such are a few of the instances which may illustrate the necessity for the co-operation of mind and body in the conduct of a farm. That the mind is strengthened by exercise, and that whenever it may be exercised it may distinguish itself by superior strength and information, are positions too plain to admit of proo or illustration. The earth yields or withholds her fruits, makes them stinted or luxuriant, by the operation of fixed laws. It can need no argument to show that he, whose dependance is on the favorable operation of these laws, should have all the knowledge of them that can be acquired, and of all the means by which their favorable operation may be propitiated. If the cultivator has a full knowledge of the quality of soils, of seeds, of manures, of plants, of roots, of animals, and of all the influences that benefit or injure them, Nature is his counsellor and fellow laborer. All her powers are to him as labor saving machines. She diminishes for him the cost of her productions. She crowns with plenty and with gladness the devotee whose love has led him to study her character and honor her affections. All cultivation is but an awakening and bringing into use powers that would otherwise lie dormant. If we consider that no limit has yet been found to the products of agriculture, but that they have continued to increase with the progress of art, and that one discovery commonly leads to another, we may well conclude that there are powers in nature not yat awaked, combinations not yet formed, and that many fields yet remain for the conquests of agricultural genius.

If the farmer has the knowledg and ingenuity, the industry and skill which justly belong to his character, the appropriate testimonies will not be wanting. He needs the herald of no mercenary partisan. He builds his own monuments. The neatness and order of his homestead, the fertility of his fields, the perfection and symmetry of his stock, and the system with which his business is conducted, are all eloquent panegyrists upon the merits of their proprietor. The improvements that he may make; the new modes of culture, and the new articles of cultivation that he may introduce; the oaks that he may plant, and the records that he may leave of his own labors and experience, may bear his name with honor to other generations.

Certainly age and long experience may in some degree supply the place of science. But nothing can show more strongly the value of science, than the fact that those who have the most enlightened experience seek with the greatest avidity its lights and aid. How much would those who have grown wise by experience, have gained by a course of systematic instruction at the outset. If by such means individual success may be increased, the evils of dependance obviated, the Agricultural luxuriance of Britain rivalled in the free fields of New-England, and the character of the people, intellectual, moral and social, elevated, then it is among our duties, as members of this Society, to disseminate Agricultural Knowledge, and to impress upon the community a sense of its necessity. Favored by Legislative bounty, and honored, as we are on this, the Farmer's Festival, by the presence of the Chief Executive Magistrate of the Commonwealth, we are bound to show that ours is not a barren soil, but that we will return the bounty a thousand fold in an increased production, and that we will emulate, though we may never hope to rival that intellectual excellence, so illustrious in another sphere.

By establishing the principle that science is necessary to husbandry, and mingling its acquisition with the labo.. of the field, that instruction of by far the most importance to individuals and to the community, the education of the heart, or virtuous habits, will be secured. With minds enlightened and characters pure, united with the manly independence which always makes a part of the Agricultural charter, the farmers of New-England need not abandon their own sphere to seek in another happiness or honor.

The scientific farmer will know when his work is done. He will plainly and distinctly discern the limits of human agency, and the boundaries of human power, and having done all and averted all which these allow, he will naturally look beyond them to discover his next reliance. In this view will be presented to him that Providence, whose Power and Goodness always surround him, and without murmuring and without repining, he will rely with confidence and hope upon the DIVINE BENIGNITY.

* In Scotland the expenditures and proceeds of farms are reduced to great certainty. In a species of banks, combining the capacities of banks for circulation and for savings, cash credits are advanced to the farmers upon the understanding that all the receipts from the farm are to be immediately paid into the bank. There is a difference of one per cent. interest between advances and deposites, in favor of the bank. By means of the accounts thus kept in the bank, the farmer and his creditor are kept accurately informed of the condition and prospects of the farm. In this is seen what may be accomplished by claculations and accounts which doubtless the farmer who values his independence will prefer to make and keep for himself.

From the New-England Farmer.

PROVIDENCE, Feb. 11, 1837.

MR. T. G. FESSENDEN,

SIR,—I perceive that you seem to recommend the use of Potatoes in making Bread. It is I presume, for economy, for no person would use them for any other purpose, in preference to flour. It should not be

forgotten that 10 oz. of flour will, with a little yeast, and a due quantity of water, make 15 oz. of bread, and that water is cheaper than even potatoes. If the bread be so made as that the moisture of the potatoes supplies the place of water, in the production of dough, you will lose all the bread, which would have been produced by the use of water. I have known potato bread made with a total loss of the potatoes, and yet heard a great boasting of the economy of the proceeding.

Will the black corn produce as much as the blue or white, if planted, both of them as they should be, three feet by 15 foot? Its earlier maturity is in its favor, but not so much as the loss of one-fourth of the crop; for in New-England the corn is not injured by frost one year in four, or perhaps eight.

Mr. Bateman, of Newport, in this State, has raised, as I am told, 1600 bushels of Mangel Wurtzel on an acre; he uses them in fattening cattle. This crop requires the whole season, while the Ruta Baga may be raised to, perhaps, three-fourths of that amount after a crop of grass, or any kind of grain. The difference in the nutritive qualities of roots should be considered, and the purposes for which they are fed.

With high respect, I am
Your obedient servant,
TRISTRAM BURGESS.

—

BY THE EDITOR.—We are ever happy to receive articles like the above, from gentlemen, whose character, mental powers, and standing in the community are calculated to turn the attention of the reading and thinking part of mankind to the pursuits of economy. With regard to converting water into nutritious matter, and making it food for animals as well as plants, we have heretofore made some remarks in a note to the Boston edition of Mowbray's Treatise on Poultry and in the New-England Farmer, vol. x, p. 389. We will now take the liberty to repeat some of those observations, as they are pertinent to one of the topics of our able correspondent's communication, and will perhaps be new and useful to some of our readers:

"It is a fact, which will be acknowledged as soon as stated, that a pound of Indian meal, or rice, or any other farinaceous substance, when boiled, contains more nourishment than several pounds in a raw state. Count Rumford has stated, "from the results of actual experiment, it appears that for *each pound* of Indian meal employed in making a pudding, we may reckon *three lbs. nine ounces* of the pudding.* And again, three pounds of Indian meal, three quarters of a pound of molasses, and one ounce of salt, (in all 3 pounds 13 ounces of solid food,) having been mixed with five pints of boiling water, and boiled six hours, produced a pudding, which weighed *ten lbs. one ounce.*† Thus we gain from the raw material more than 300 per cent. in weight, and, no doubt, the gain as respects the quantity of nutriment contained in the pudding, over and above the component parts as they existed before boiling was still greater. The gain of weight in rice, in consequence of boiling, is more considerable than that of Indian meal, and every one knows that a small quantity of oat-meal will produce a very great relative proportion of gruel."

* Count Rumford's Essays, vol. 1 p. 258.—Boston edition.

† According to Sir Humphrey Davy's Table of the Quantities of Soluble or Nutritive Matters afforded by different vegetable substances, 1000 parts of wheat afford 995, whole quantity of soluble or nutritive matter, 765 of mucilage or starch, 190 of gluten or albumen. Potatoes afford by analysis, the same materials, but in a smaller proportion and the addition of saccharine matter, viz: from 1000 parts, from 260 to 200, whole quantity of soluble matter, from 200 to 155 mucilage, or starch, from 20 to 15 saccharine matter, from 40 to 30 gluten. As wheat and potatoes both contain mostly the same constituent parts, one would suppose there could be no loss by their mixture in bread; but there are properties belonging to the potato part of the mixture, which do not belong to that which is composed of the flour. The potatoes are cooked and boiled before they are mixed with the flour or dough, while the flour is a raw material, and potatoes, we believe, are not increased in bulk or substance, by any process in cooking, like flour, Indian meal, or rice, &c. This subject, however, deserves further investigation, and our able correspondent, by resuming it, would oblige us, and probably benefit the public.

We copy the following Report of a Committee of the Massachusetts Agricultural Society, in relation to Grain Crops, from the New-England Farmer.

AGRICULTURAL TRANSACTIONS.

The Committee appointed by the Trustees of "The Massachusetts Society for the Promotion of Agriculture," to examine the claims for Grain Crops—Report as follows:

The past season having been unfavorable for production, the applications were but few in number.

This was a source of regret, as the object most wished for by the Society, is ever to procure and to disseminate the best results from the various practices of skilful agriculturists, so that every discovery and improvement may be availed of, and spread before the community, for the benefit of the country.

Whilst the Committee offer this in excuse for the lack of experiment and application—and lament the want of individual exertion—they yet feel constrained to admit that there seems to be a disposition in our Farmers to cling too much to ancient practices, as if no new light was to be attained by any further research. This too prevails at a time when the diffusion of knowledge in all the arts and professions of life, affords so much room for hope and gratification in prospective. Why might not the efforts and successful practice abroad, be looked to with advantage? Can nothing be gained from their modes of culture? Is there no benefit in the uses of marl, lime, salt, &c., with their paring, burning and admixture of different soils, as in constant practice and competition amongst their farmers? This zeal and spririt is commendable, at least of which we have the evidence in our present supplies by importation.

Shall we allow it to be said whilst ingenuity and enterprise, skill and discovery are the distinguishing traits of our countrymen in other respects, that our fathers have acquired the extent of capability in the improvement of soil? We must not acquiesce in this, but look to better things.

The liberality of the State justly calls for further exertion. The efforts of the Society are in constant exercise; their income is cheerfully awarded with the cherished hope that they may, in some degree, promote the interests and prosperity of agriculture. Our earnest hope is that these motives may be duly estimated.

The Committee recommend that the premium of twenty dollars be paid to Edward C. Sparhawk, of Brighton, in Middlesex County, for a crop of Rye, raised on 5 acres, 1¼ rods of land, making an average of about thirty-five bushels to the acre.

The course of practice of Mr. Sparhawk, appears to have been judicious, and no inducement was given to the misuse of this staff of life in its conversion into ardent spirits.

How painful is it to read in a time of scarcity like the present, that on its arrival at a neighboring port, fourteen thousand bushels of Rye were bought for the distillery!! What a loss of human comfort and happiness, by the conversion of the means of sustenance into a deadly poison has this effected!!

The Committee further recommend, that a premium of twenty dollars be paid to William Carter, of Fitchburg, in the County of Worcester, for a crop of 59¼ bushels of Barley, raised on one acre of land. This was the more remarkable, as no manure was used on the land at the last year.

Where a large crop is expected at the laying down to grain, the benefit of the plough seems lessened, when a dressing of manure is not afforded at this period: but the difficulty of an even application, in the spreading thereof, and the lodging of the grain where this is not well effected, and the soil induces farmers in general to refrain as was the fact in this case.

All which is submitted, Per order of the Committee.

JOHN WELLES, Chairman.

—

BRIGHTON, Nov. 23, 1836.

BENJ. GUILD, ESQ., Boston,

SIR,—Noticing a premium offered by the Massachusetts Agricultural Society, for the greatest quantity of Rye raised on an acre, the following is an account of a crop of Rye that I raised on about five acres of land in one piece, and harvested in July, 1836. The land was broken up in the autumn of 1832, a part of which was

ploughed at the Cattle Show in that year. In the spring of 1833, the land was not ploughed, but was well harrowed and manured in the furrow with about 20 cords of compost manure, part bone manure, and part from the yard of our barn; then planted with corn, potatoes and vegetables for the market. The land was ploughed in the autumn of 1833, and in the spring of 1834, I manured with a compost of about eight cords from the slaughter yard, with which was mixed about 3 cords of swamp mud, that was carted into said yard the year previous. About one cord of loam, and about one hundred and fifty bushels of leached ashes, the remainder was stable manure, in all about twenty five cords.—Being all worked together, then spread, ploughed, harrowed and furrowed, and planted as the year previous. In the autumn of 1834, the land was well ploughed with one of Howard's ploughs. In the winter following, I commenced getting my manure on the land of which I should judge not far from 30 cords similar to the preceding years. In the spring, I commenced spreading the manure, then ploughed, harrowed, furrowed and planted, as before stated. In September, 1835, the crop being all removed, I commenced ploughing the same, and on the first week in October, I sowed on said five acres of land, in one day and two hours, twelve bushels of Rye with grass seed; the land was then harrowed and bushed, and in July, 1836, I harvested the Rye that grew on said five acres, all being in one piece, and when threshed and clear from chaff, measured up 178½ bushels, making an average of about thirty-five bushels to the acre. The entire expense of cultivation is estimated at sixty-three dollars, all of which was performed without any ardent spirits being used.

All which is respectfully submitted by

Yours, &c.

EDWARD C. SPARHAWK.

—

BRIGHTON, Nov. 23, 1836.

This may certify that I was in the employment of Mr. Edward C. Sparhawk, of Brighton, the past season, and did assist in harvesting and measuring up the Rye raised by him the past season, and that the aforegoing statement by him subscribed, is true according to the best of my knowledge and belief.

SILAS MERRILL.

—

BRIGHTON, Nov. 24, 1836.

This may certify that I have this day surveyed a lot of land for Mr. Edward C. Sparhawk, of Brighton, on which he raised a crop of winter Rye the present year, and find said lot to contain 5 acres, one and a half rods, and no more.

ELIJAH F. WOODWARD, Surveyor.

—

BRIGHTON, Nov. 24, 1836.

MIDDLESEX, ss.

That the above named Elijah F. Woodward, personally appeared and made oath that the above certificate by him subscribed, is true according to the best of his knowledge and belief, before me,

EDWARD SPARHAWK, J. P.

FITCHBURG, Nov. 28, 1836.

To the Trustees of the Massachusetts Society for the Promotion of Agriculture.

The undersigned, William Carter, of Fitchburg, in the State of Massachusetts, presents himself as a claimant for the premium of the Massachusetts Society for the Promotion of Agriculture, for the greatest quantity of Barley raised on one acre of land the present year, and gives the following statement respecting the same. The piece of land on which the above named crop of Barley was raised, was ploughed from the green-sward in the fall of 1834, and planted in the spring of 1835, with Indian Corn, and yielded but an ordinary crop. The manure used the last year, was fermented manure in common quantity, dropped in the hill. The last spring it was in the hill as it was left when the Corn was taken off, and first split with the plough, and then was cross-ploughed, and four bushels of the common two rowed Barley was sown on the furrow, and harrowed in, it was then sowed with grass seed, and rolled with a common roller. No manure of any kind was used on the land the present season. It was sown the first of May, and harvested the middle of August, threshed the last of October, and the crop was ascertained by actual measurement to be fifty-nine bushels. The entire expense of cultivation was,

Ploughing,	$3 00
Harrowing,	1 00
Seed, 4 bushels,	4 00
Harvesting,	3 00
Thrashing, &c.	5 00
	$16 00

The seed was sown by John Stickney, who also assisted to harvest, and measured the whole crop, whose certificate is subjoined. I also endorse the certificate of Philip Flowdin, Surveyor, as to the quantity of land.

WILLIAM CARTER.

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I hereby certify that according to the best of my knowledge and belief, the above statement is true.

JOHN STICKNEY.

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COMMONWEALTH OF MASSACHUSETTS:

WORCESTER, ss. Nov. 28, 18 6.

Then the above named William Carter and John Stickney, appeared before me, and made oath to the truth of the above statement.

EBENEZER TORREY, J. P.

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FITCHBURG, Oct. 15, 1836.

This is to certify that I, P. F. Cowdin, of Fitchburg, in the County of Worcester, being a sworn Surveyor, have this day measured a piece of land owner by William Carter, of Fitchburg, aforesaid, where Barley grew this season, and find it to contain one acre and no more.

P. F. COWDIN.

From the Practical Farmer.

MORUS MULTICAULIS.

SIR,—Having seen many statements and suggestions in public prints, that the Chinese mulberry. (morus multicaulis,) was not as hardy as the White mulberry, and that it would not bear the extreme cold of our winters, &c., I deem it proper to state my own observation on the subject. I was the first person south of New-York, who had the Morus Multicaulis; it was sent to me by my old friends, Wm. Prince and Sons, in 1828, in a collection of seven other varieties of mulberry. It was not then known by the present name, but it was called the Phillipine Island mulberry, and I believe was received by the Messrs Prince direct from those Islands. About a year after I received it, accounts were received from France of the receipt there of the Morus Multicaulis, and of its great value for feeding worms. On examining my trees, I at once found that my Phillipine Island Mulberry was the Multicaulis, and immediately commenced feeding my Silk worms with it; and from experiment, ascertained the truth of all the French had said about it. From that time to this, I have continued to urge upon all, the propriety of cultivating this, in preference to the white mulberry. Its advantages are, it is full as hardy as the white; one pound of its leaves contain as much nutritive matter as a pound and a half of the white; the silk made from it is of a finer texture and more lustrous; its leaves are so large that a pound can be gathered at half the expense and trouble that a pound of White Mulberry leaves require; it can be cultivated with infinite y more despatch than any other kind. These are all great advantages, and I am so well convinced of the correctness of this statement, that I do not hesitate to say, that within ten years, no other mulberry will be cultivated for feeding silk worms; simply because those who feed the worms upon the mulberry leaves will not be enabled to compete with those who feed on Morus Multicaulis, and they will be either compelled to abandon the silk business, or adopt the multicaulis for feeding. In relation to the hardiness of the Morus Multicaulis, I have cultivated it for seven years; never protected it in any manner whatever, and never lost a tree by the cold of winter, or any other way. I had fifty young trees in my garden last winter, and not even a bud on the extremity of the branches was injured. It is true that about fifty yards west from where the young trees stood, there is a grove of oak trees, and on the north, fifty yards distant, my dwelling-house stood; and my garden has an exposure to the south, with a gentle declination. But my residence in the winter of 1831–2, was very different. It was on a farm, four miles in the country, in a northeast direction: the situation at an elevation of 3 to 400 feet above the tide water. There my Morus Multicaulis had an open exposure to the north-west wind; yet none were injured. During the whole time, I have had the white mulberry of various varieties, and have observed that they were all equally hardy—none more so, than the multicaulis. I have seen the young *unripened wood* of all varieties destroyed by the winter, and was very early led to adopt measures to guard against it, and now I never lose a bud.

None but the young trees are ever injured by winter, and all we have to do is to give them such a start as to enable them to ripen

their wood previous to the approach of very cold weather. I raise all my trees from cuttings in a hot bed. About the first of March, I make an ordinary hot bed, like those used for cabbage plants; then I take the young wood of last year's growth, and cut it into pieces about two inches long, merely leaving a single bud on each; these I stick in the hot bed, three inches apart, in a slanting direction, the upper end inclining to the north, and burying it so that the bud is scarcely seen at the surface of the earth; sprinkle the bed with a watering pot, and put on the glasses; keep the bed properly moistened by watering every day, and throw matting over the glass at night, and in the middle of the day, to protect both from frost and the hot sun. By the middle of May, the plants will be four, six or eight inches high, and may then be transplanted to the place they are to grow, like cabbage plants, watering them once a day for eight or ten days, if the weather is dry; they will be found to be well rooted, and will grow from four to six feet the same season, and will ripen their wood so that the ensuing winter will not injure them. After the first year, I have never seen any of them lost by the winter, except in some extra cases, and in these the white mulberry has suffered, and even the native mulberry, fully as much as the multicaulis. Last winter, a white mulberry tree, seven or eight years old, in the western part of the city of Baltimore, was killed to the ground; while my Morus Multicaulis not a quarter of a mile from it, and north of it too, and in a higher situation, was not injured. GIDEON B. SMITH.

From the Genesee Farmer.

BEET SUGAR.

BY W. G.

There seems to be some little conflicting difference of opinion on the possibility of manufacturing beet sugar profitably by individuals or families, among those whose attention has been drawn to the subject, and who profess to speak from experiment. For instance, Mr. Sleigh of Philadelphia, in a late communication to the U. S. Gazette of that city, says: "An establishment will not clear its expense, unless it be calculated to manufacture at least from two to five hundred pounds of sugar a day; so that the idea of individuals in this country manufacturing profitably for private consumption is preposterous; their sugar would stand them, including labor, a dollar a pound." This opinion Mr. Sleigh says he has come to "after numerous experiments."

On the other hand, Mr. Le Ray de Chaumont, Mr. Isnard, and others intimately acquainted with the manufacture in France, assert that there can be no doubt of the practicability and profitableness of domestic or family manufacture, and that there are large quantities actually so manufactured in France. In addition to these statements, in "Journal des Debats," of April 15, 1836, appears an article on on this subject, in which it is stated, that four residents in the village of Wallers, department of the North, formed an association for making sugar, subscribing 50 francs each as capital. One was a blacksmith, the others farmers. These men were able to make from 40 to 50 lbs. a day, of sugar of a medium quality, a result surprising, considering their simple mode of conducting the process. They used curry combs to rasp the beet roots, used linen bags for expressing the juice, and the syrup thus obtained, was boiled in pots on the blacksmith's fires. Several others are mentioned as having introduced the business on a small scale successfully, and the French editor intimates as his opinion, that the time is not distant, when every family in that country, will make their own sugar, as they now do their preserves.

That some experience in the manufacture of beet sugar by companies and capitalists in this country must be acquired, before it can be introduced into families, can be readily conceived, but as the processes become simplified, and our farmers become familiarized with them, and with the culture of the beet, we can see no reason why it cannot be as well made in families here as in France; and there is no reason for doubt but that it will. If with cooking pots and a blacksmith's fire, six or seven dollars worth of sugar were produced; there can surely be no obstacles that American perseverance, and an improved apparatus will find insuperable.

From the Quarterly Journal of Agriculture.

THE PROCESS OF RUMINATION OR CHEWING THE CUD IN CATTLE, EXPLAINED UPON THE EXPERIMENTS OF M. FLOURENS.

If a farmer were to maintain literally the vulgar opinion that the sun rises from behind the eastern mountains, and sets in the western sea, it might not lead *him* into any practical inconvenience; but unless this opinion had been corrected by astronomers our ships could never have been steered, except at random, through the trackless ocean—though the establishment of the fact of the sun being in some degree at rest, while the earth turns round somewhat like a grass-roller, was not, upon its discovery, anticipated to be of so great practical importance as it has proved to navigation. In the same way may the correction of other popular errors lead to unexpected results of interest and value; while, independent of this, it can never be unimportant to establish truth on a sure basis. It is on this general principle that it is here proposed to correct the mistaken notions which have hitherto prevailed respecting the process of rumination or chewing the cud in cows, sheep, goats, and deer.

In proportion as knowledge is better than ignorance, it must be important for the farmer to have a correct notion of the process of digestion in his live-stock, inasmuch as it may render him better able to bring them into and keep them in good condition, as well as to prevent disorders, and to cure them when they occur. Accordingly, when we consider the singular modifying influence of chewing the cud in the process of digestion, and still more the influence of digestion itself on health and disease, we must admit that the examination of the process is highly interesting, though it is not a little strange that the inquiries of the most celebrated physiologists have often led to doubtful and contradictory results, a fact which can only be accounted for from the complication of the process, and the difficulty of tracing its several steps.

M. Daubenton, the distinguished coadjutor of Buffon, says, that "it has been in vain attempted to explain the mechenism of this singular operation;"* and John Hunter, the greatest physiologist of modern times, expressly says, "In those animals whose stomach consists of several cavities, the precise place where digestion is carried on has not been ascertained.†

M. Bourgelat, also an eminent modern French writer, says of the authors who have preceded him upon rumination, that "they appear to have been afraid to grapple with the difficulties connected with the discovery of the mechanism, ... and that the rapid glance which they have thrown at the object seems a tacit confession of its being to them inaccessible." Yet M. Bourgelat himself has made little or no progress in the discovery, and tells us that "he only proposes his ideas upon it as doubts or as simple conjectures."‡

D. Bostock, in 1828, speaking of the organs of digestion in ruminating animals, says, "there is some doubt as to the effect which is produced by the different parts of this complicated apparatus, and as to the use which they serve in the economy of the animal."§

M. Flourens, again, writing so late as September 1832, says, that up to the present day there has been nothing better than doubt and conjecture respecting the mechanism of rumination; and it was this which incited him to make the very satisfactory, though it must be confessed, very cruel experiments, that appear to clear up the whole mystery. Previous, however, to detailing these important experiments, it may not be uninstructive to take a brief retrospect of the statements of the older writers, and of the structure of the organs.

Aristotle and Galen, under the notion that rumination was peculiar to horned animals, were somewhat puzzled to account for the camel and dromedary ruminating; and St. Jerome was curious enough, when commenting on the Levitic law prohibiting camel's flesh, to ascertain the fact, "I went out," he says, "in the evening, and saw camels roll the food previously swallowed in their mouths, and bring up again what had passed for nourishment."‖ Without going more minutely into the subject, they all seem to agree in the notion that rumination is indispensable, in consequence of hard or prickly herbage being used as food; yet it is not a little singular that such writers as Galen,** Albertus Magnus,†† and Aldrovand, should, not have adverted to the well-known instance of the ass, which feeds on prickly and woody plants without ruminating. One plain fact will easily overturn the most ingenious theory.

There is some doubt respecting the derivation of the word rumination, some, with Isidore,‡‡ referring it to a bulging in

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* Observations on the Animal Economy, p. 212.
† Mem. Acad. des Sciences for 1768.
‡ Elemens de l'Art Veterin, t ii.
§ Element Syst. of Physiology, 2d. ii. ed. 451.
‖ Apud Aldrovand de Quadr. Bis. 905.
** De Animal. lib. iii.
†† Apud Aldrov. ut supra.
‡‡ Admin. Anat. vi. 3.

the throat termed *rumen*, and others, with Nonnius Marcellus,* applying the term *rumen* to the paunch, or first stomach; but whatever may be the origin of the term, the process, so far as it can be externally observed, consists, as St. Jerome describes in the camel, in bringing up into the mouth the food previously swallowed, remasticating it, and again swallowing it. The interior mechanism by which this process is performed can only be investigated and understood by an examination of the organs. Except in rare individual instances, as in man, and in the kangaroo, the process of rumination is connected with a complicated stomach, very different from the simple stomachs of carnivorous or frugivorous animals, for instead of one cavity, there are at least four communicating cavities or chambers, each having a peculiar structure, and no doubt a corresponding peculiarity of function.

In the cow, the sheep, and other ruminating animals, the first cavity or chamber of the four-parted stomach, termed the paunch or maw (*Ingluvies*), is by far the largest of the four, is somewhat divided by ridges into several compartments or paunches, and is lined with a rough membrane, studded with small flat projections, two circumstances very important to be recollected. It is situated towards the left side, and serves by its heat and somewhat scanty moisture to prepare the herbage for farther change. It is inferred to have a rotatory motion, from the rounded masses of hair called bezoar stones, frequently found in it, arising from the conglutinated hairs licked off from time to time by the animal when cleaning itself, and said, without proof, to be miraculously medicinal. It is of a very extensile texture, and is frequently much stretched by over gorging it with food, its capaciousness, indeed, appearing to depend in some measure on the sort of food which is given to the animal. M. Daubenton says, that in a calf which has never eaten grass, though not very young, the paunch is proportionably much less than in the full grown ox, and infers that its usual great size is caused by the great mass of herbage daily devoured, and the fermentation which this always more or less undergoes. To prove this view of the matter, he tried the following experiment. He fed two lambs of equal ages, and weaned at the same time, the one with bread, and the other with grass. At the end of twelve months, he killed them, and found that the paunch of the one fed with bread was very remarkably smaller than that of the other. Connected with the extensile structure of the paunch is its comparative want of sensibility, in consequence of which the animals go on eating without being satiated, till it is frequently over crammed, as graminivorous birds will likewise do, from their crop or craw being very similar to the paunch of ruminating animals. Now, it is obvious, that when the paunch has thus been over crammed with succulent herbage, such as green clover, it will speedily ferment, in consequence of being subjected to animal heat, and excluded from the air, producing an extrication of more gas than can escape by the gullet. In such circumstances the animal is said to be blown or hoven, and fatal consequences may and do often ensue, from the gas increasing till the sides of the paunch are burst through, and its contents discharged among the intestines. But even when this does not take place, the distention caused by the gas impedes or suspends the process of digestion, by preventing rumination, which, as will presently be made to appear, it must do.

The second cavity or chamber, termed the king's-hood or bonnet (*reticulum*), is situated on the right side, on the same level with the paunch, but hung upon it as a side pouch, or parallel sheath. It is very much smaller than the paunch, is lined with a rough wrinkled membrane continuous with that which lines the paunch, and the whole inner surface presents a net-like appearance, from a sort of ridged projections in polygonal meshes, or shallow cells, similar to a honeycomb. The functions of this cavity have given rise to the most contradictory opinions among the best physiological writers, as we shall afterwards see.

The third cavity or chamber, termed the maniplies (*omasum*), is the smallast of the four, and of a more complicated structure. The English name of maniplies, has been given from this structure, the inner surface rising up in many folds, one above the other, amounting from about forty in the sheep to about a hundred in the ox, forming about half those numbers of partitions, and all covered with a continuation of the rough membrane that lines the two first cavities. Some of these fields project farther than others, there being first two long ones on each side, within these two shorter, then two longer, and so on throughout the chamber. The smallest of these folds, lying between the opening from the second chamber or king's-hood, are puckered so as to act as a valve between the third chamber and the fourth.

The fourth and last cavity or chamber termed the red or rennet bag (*abomasom*), and by some the digestive stomach, is of a larger size than the third, but less than the first, being about two feet and a half long in the ox, is of an irregular conical form, and communicates at its base or broadest part with the third by means of a valvular orifice, rendering regurgitation or vomiting impossible. The inner surface is furnished with a number of simple wrinkles or irregular folds, more or less extended, eighteen in number in the ox, beginning at the upper and disappearing before they reach at the lower end. This is also studded with projections, which take a rather serpentine or winding direction. The rough membrane which lines the three first cavities does not extend into the fourth, which is lined with a soft mucous membrane, similar to that of the human stomach, and having the property of curdling milk, hence the fourth stomach of the calf is used.

So much for the four chambers or four stomachs as they are sometimes considered; but we would ill understand the process of rumination, were we not to examine minutely the manner in which they communicate with the gullet, or with each other.

The meat pipe or gullet (*œsophagus*), is an extensile membranous tube, much more complicated in ruminating quadrupeds than in man, the muscles which surround it being strong, and consisting of two rows of muscular fibres, crossing each other, and running spirally in opposite directions.—The contractions of these muscles force the morsel of food begun to be swallowed onwards into the inlet (*cardia*) of the stomach so powerfully, that the process once commenced cannot be stopped, even by the will of the animal. The gullet enters the stomach of ruminating animals just where the three first chambers approach each other, discharging itself, as M. Flourens remarks, almost equally into the two first chambers.

We request particular attention to another part of those digestive organs which, being indispensable to rumination, may be termed the cud-duct (*ductus ruminans*).—This is sometimes a groove and sometimes a tube, according to its action, and runs from the termination of the gullet to the third chamber, with the first chamber on the left, and the second chamber on the right of it, discharging itself, according to M. Flourens, almost equally into the second and third chambers. This cud-duct has thick prominent margins, which can, as remarked by Blumenbach, be brought to meet so as to form a complete canal, and thus constitute a continuation of the gullet across the second into the third stomach. It was ascertained, as we shall afterwards see, by M. Flourens, that the cud-duct, contrary to the assertion of Blumenbach, remains always open, even when the gullet inlet (*cardia*) of the first chamber is closed. "All these parts," says M. Flourens, "the gullet, the cud-duct, the first, the second, and the third stomachs, not only communicate with each other, but they all communicate by a common point, the point where the gullet terminates, where the cud-duct commences, and towards which the three stomachs open or end."

Now, in whatever way we look at this anatomical structure and mechanism of the parts, we cannot determine many questions which arise as to their operations and functions. For example, as the ruminating animal chews its food and swallows it twice, it may be asked, into which of the three chambers it passes at the first or at the second swallowing, since that the gullet, either by its inlet (*cardia*), or through the cud-duct, communicates with each of the three? According to Duverney,* M. Perrault,† Blumenbach,‡ and Bostock,§ the food, when first swallowed, goes exclusively into the first chamber; while according to Daubenton,‖ Camper,¶ and others, it goes equally into the first and the second chambers. According to Haller,** the food, when swallowed the second time,

*Isid Hispalendis, Original. xii. 1.

*Œuvres Anatom. ii. 434.
†Œuvres diverses, p. 430.
‡Comp. Anat. § 90. 1
§Element. Syst. ii. 449.
‖Mem. de l'Acad. Roy. des Scien. 1763.
¶Œuvres, iii. 49.
**Element. Physiol. vi.

is returned into the first chamber; while according to Duverney, Chabert,* and Toggia,† it goes into the second chamber; and according to Daubenton, Camper, Blumenbach, and Bostock, it goes exclusively into the third chamber. Again, it may be asked, from which of the chambers is the food first swallowed passed back to the mouth to be remasticated? Duverney, says from the first chamber; Daubenton, Blumenbach, and Bostock, say from the second chamber; and Perrault says from the cud-duct. These questions then, as well as the manner in which the first swallowed food is brought up into the mouth to be remasticated, were all doubtful and undetermined previous to the experimental investigations of M. Flourens, of which we shall now give a detailed account.

In order to determine the first question, as to the particular chamber or chambers into which the food is discharged when first swallowed previous to rumination, M. Flourens caused a sheep to eat a quantity of fresh lucern, and opened it immediately afterwards before it had time to ruminate. He found the greater portion of this herbage, easily recognisable by the leaves, almost unbroken in the paunch or first chamber, and also another smaller portion no less distinguishable by its equally entire leaves in the king's-hood, or second chamber. Neither the third nor fourth chambers contained any portion of the lucern.—He repeated this experiment a great number of times with herbage of every description, and uniformly with the same result, of the greater portion of the non-ruminated food being found in the paunch, a smaller portion in the king's-hood, in both cases equally unchanged, and none at all in the third and fourth chambers. M. Daubenton, therefore, must have been deceived by some effects of a previous rumination, when he says, "I remarked in the ox, as the aliment (hay) was passing into that part which forms the second stomach, that it was reduced to a kind of green paste resembling boiled spinage." Blumenbach is equally mistaken in saying that the food goes out of the reservoir of the paunch in small portions into the second stomach.

It being necessary to determine whether the same results would follow with other species of food besides herbage, M. Flourens caused a sheep to eat oats, and opened it immediately before it had time to ruminate. He found the greater portion of the grain unbroken in the paunch, and a smaller portion in the king's-hood equally unbroken; while the third and fourth chambers did not contain a single grain. He repeated this experiment a great number of times with all sorts of corn, rye, barley, wheat, and the like, uniformly with the same result, the grain, like the herbage, going exclusively into the two first chambers at the first swallowing. Having thus ascertained that the kind of aliment does not alter its route, M. Flourens next tried what effect a difference of volume would produce, and with this view caused three sheep to swallow pieces of carrot from half an inch to one inch in length, preventing the animals from chewing them by passing them back into the gullet through an iron tube. In one of the three sheep he found all the pieces of carrot in the paunch, and none in the king's-hood; while in the two others, he found pieces of carrot in the king's-hood as well as in the paunch; but in none of them were any pieces of carrot in the third or fourth chambers.

It being thus proved that neither the sort of food nor its magnitude of volume, had any effect upon its route, it remained to ascertain whether the diminution of its volume or its being more or less fluid, would influence it in any way? With this view, a quantity of carrots were reduced by mastication to a thin pulp, and two sheep were made to swallow this, and immediately opened. In both, M. Flourens found the largest portion of the carrot pulp in the paunch and in the king's-hood, but he also found in both a smaller portion in the third and in the fourth chambers. It appears, therefore, that unless aliment be reduced to a fluid or half fluid state, it does not, upon being first swallowed, pass beyond the king's-hood or second chamber.

As a general remark it is important to mention, that in all the preceding experiments, M. Flourens always found, both in the paunch and the king's-hood, together with the fresh swallowed and non-ruminated food, considerable quantities of other aliment, more or less bulky or dry, attenuated or fluid, and conseqently affected by the process of previous digestion. He also found that there was almost uniformly a greater proportion of the bulky and dry digested aliment in the paunch, as there was almost uniformly a greater proportion of the fluid and attenuated aliment in the king's-hood.

So far the inquiry was easy, and the point to be ascertained simple, as it was only requisite to trace the food, little changed as it is by mastication, and consequently not difficult to be recognised; but the case is very greatly different in the instance of ruminated aliment and the second swallowing. At first, this aliment is more or less softened, and more or less macerated by its remaining in the two first chambers. It is also more or less divided, and more or less chewed by the second mastication, whence it is much more difficult to recognise such altered aliment, and consequently to trace it in its course through the several chambers.

It is obvious, therefore, that there are two modes of determining this question, one by means of some character which may certainly determine ruminated aliment in whatever character it may be found; or in default of such a character, another, by which it can be at once determined what aliment has just entered any of the chambers, and to follow this aliment into each of the chambers the moment it enters. Hitherto all authors seem to be agreed, in the supposition that ruminated aliment carries with it a character distinguishing it from every sort of aliment, and hence the most simple and superficial experiments, all of the same kind, have appeared to be conclusive as to its course through the digestive organs. These experiments consist in making animals eat herbage, hay, and the like, opening them sometimes before and sometimes after rumination, and judging from the appearance of the aliment, ruminated or non-ruminated, found in each chamber, the part taken by each in the process of rumination. The results accordingly depend altogether on the supposed certainty of the characters distinguishing ruminated from non-ruminated aliment. If however, we examine the points upon which these experimenters found this distinction, it appears that they consider all aliment which is coarse and bulky non-ruminated, and all which is reduced to a certain state of division or attenuation ruminated. From their going upon characteristics so very vague, it is not difficult to account for the discrepancies into which they have fallen.

Taking the instance of the first two chambers, it appears, from the preceding experiments of M. Flourens, that the paunch and the king's-hood almost always contain, together with the coarse and dry aliment, other aliments more or less attenuated or fluid, and according to the regimen of the animal it will be presently made appear that these two chambers may contain either dry and coarse or fluid and attenuated aliment. It will therefore be evident, that, according to the particular case observed by each author who follows these vague distinctions, each will form a conclusion contradictory to the others. The paunch, for instance, frequently contains, besides the dry and coarse aliments, other aliments reduced to a certain state of attenuation and division; and Baron Haller, who particularly remarked these comminuted aliments, concluded that ruminated aliment, on being re-swallowed, was discharged into the paunch. The king's-hood likewise sometimes contains nothing but coarse aliment, and hence Daubenton and Camper, who have observed this, concluded that the king's-hood only contained non-ruminated aliments; but the king's-hood sometimes contains nothing but thin and fluid aliments; and hence Chabert and Toggia, who had remarked this, concluded that the king's-hood only contained ruminated aliments.

Now it is requisite, first of all, to consider that division or attenuation may not always be produced by rumination, since there are other forces in operation which may attenuate and divide the aliment. Such, for example, is the contractile force of the paunch, more particularly where it is crossed by the ridgy folds already described, and grains of oats introduced artificially at first, swell and become soft, so that their interior pulp is as fluid as milk; then they throw off their envelopes, and if these are gradually reduced to fragments or *debris*, without the assistance of rumination, that is, of a second mastication, the gullet, in M. Flourens' experiments having been previously tied, to prevent the possibility of such an occurrence. It is therefore obvious, from this alone, that when aliament is found in any of the chambers attenuated or divided, that it may not always have undergone the process of rumination; and hence the previous experiments

* Des Organes dans le Ruminans.
† Su la Rumination.

of Daubenton, Haller, Chabert, Toggia, and others, are all faulty, from the authors not being aware of the attenuating action of the organs, independent of the process of rumination.

From the experiments above detailed it is proved that the food, on being first swallowed, goes into the two first chambers; but it is not proved that it goes immediately into both, and Daubenton and Camper suppose it to pass first into the paunch before going into the king's-hood. None of the experiments previously devised, how varied soever they may be, could solve this question, because, in all those experiments it was not immediately during the act of swallowing, but always a certain time after, and therefore subsequent to the possible passage of the aliment from one stomach to another, subsequent, in a word, to the death of the animal, that the experimenter can penetrate to the two chambers to examine them. The impossibility of arriving at any certain conclusion on the old system, suggested to M. Flourens a new manner of experimenting, highly objectionable, however, on the score of cruelty.

It is well known that animals, and even man himself, may survive for a greater or shorter period with artificial openings, either in the stomach or in the intestines, and hence M. Flourens conceived the idea of making such artificial openings in each of the four chambers, so as to be permitted to penetrate into the interior of each of the chambers whenever he chose, and in this way to ascertain the points in question by direct observation.

M. Flourens began by establishing a large artificial opening in the paunch of a sheep, that is to say, he first made an opening through the membranes of the paunch, and then drawing asunder the edges of the wound fixed them by suture to the adjacent parts of the abdomen,—precautions indispensable for preventing the escape or the passage into the abdomen of the matter contained in the paunch, whether to bring nothing but the mucous surface of the chamber in contact with the exterior air, or to permit the experimenter to penetrate more easily and more certainly into the cavity.

When he had established the artificial openings in this manner, he waited till the animals began to eat. One ate the same day, and others two or three days after the operation, all not being at first equally affected by it, though some time later, when the primary effects have gone off, the general effects are in all cases nearly the same.—Thus almost all the animals in which an artificial opening is established in any of the stomach chambers except the fourth, eat much more frequently than in their natural state, in consequence of a portion of the food escaping through the opening, and they also, for the same reason, drink a great deal more-but they ruminate less often, and become rapidly lean, seldom surviving many weeks, and often not more than a month.

When a sheep with an established artificial eponing begins to eat, in a few seconds a part of the food which it swallows escape by the opening in proportion as it eats and swallows. Besides, upon introducing his finger, and directing it towards the gullet, M. Flourens felt the aliment enter into the paunch, at the instant it was carried thither from the gullet. It is consequently certain that the aliment upon being swallowed the first time passes directly into the paunch, but the experiments did not determine whether any food also passed into the king's-hood.

M. Flourens established an artificial opening in the king's-hood of another sheep, and when the animal began to eat he observed a portion of the food escape by the opening as it was swallowed, and on introducing his finger by the opening into the king's hood, he felt it enter into it the instant it was carried thither from the gullet. It thence appears proved, that the aliment, upon being swallowed the first time, passes immediately into the king's-hood as well as into the paunch.

In another sheep M. Flourens established a double artificial opening, one in the paunch and a second in the king's-hood, and by alternately introducing his finger into each, he felt, as in the two preceding experiments, the food arrive in each of the two chambers. But besides, he observed, even when the animal was neither eating nor ruminating, that the abdomen slightly contracted; and when, during such contractions, he introduced his finger into the paunch, he felt that also contract, and at the same time he could likewise feel a portion of food carried from the paunch forward into the king's-hood. It has been already stated that the paunch is towards the left, and the king's-hood towards the right side of the animal; and M. Flourens proved, that when any substance was introduced into the left artificial opening of the paunch, in a certain time afterwards it came out more or less altered by the right artificial opening in the king's-hood. It has also been already stated that the paunch is paved by membranous ridges into several partitions or pouches. Now, if any substance be put through an artificial opening into the pouch or partition farthest from the king's-hood, this substance will pass gradually and successively into the other partitions in the direction of the king's-hood, till it at length enters into it. It is consequently proved, not only that the food, on being first swallowed, goes immediately into the two first chambers, but also that this food can pass from the first to the second chambers directly, without being subjected to the process of rumination. In order to ascertain the peculiar action of the paunch and of the king's hood, M. Flourens introduced a variety of substances, and among others he sometimes introduced directly through the artificial openings small living animals, such as frogs, gray lizards, slugs, and earth worms. In every instance these animals speedily died, and their texture was soon altered by the digestive powers of the stomach. Similar experiments made upon rabbits was uniformly followed by the same result, and consequently the popular opinion that small animals being swallowed and remaining alive in the human stomach and causing disorders must be considered untenable. The result of these experiments in explaining rumination will afterwards appear.

Although the establishment of artificial openings in the stomach causes animals to ruminate more seldom, it does not stop rumination, which often takes place in such circumstances several times a-day, and during the process M. Flourens introdnced his finger frequently to ascertain what was going on within the chambers. Upon the food being swallowed the second time, he could feel some of it enter immediately from the gullet into the paunch, and also into the king's-hood, as occurred when it was swallowed the first time. But besides this, on separating the edges of the artificial opening he could see a portion of the ruminated aliment go along the cud-duct into the third chamber or maniplies; and by means of an artificial opening in the fourth chamber, he was able to follow it thither. It appears certain, therefore, that a portion of the ruminated aliment is returned into the two first chambers, while another portion passes immediately by the cud-duct into the third chamber.

The preceding experiments relate only to solid food; but as authors have all stated the route of liquid aliment or drink to be different in ruminant animals, it became interesting, by the direct evidence obtainable through artificial openings, to ascertain the correctness of their statements. According to Camper, the greater part of any liquid swallowed is conveyed to the maniplies or third chamber, while a portion only remains in the paunch. "When animals," says Dr. Bostock, following Sir E. Home, "that possess a ruminant stomach take in liquids, they are conveyed, in the first instance, into the second stomach, where they serve to macerate the food as it passes from the paunch, so as to prepare it for the process of rumination."*

When an artificial opening is established in the stomach of any animal, it drinks much oftener than it does in the natural state; and while it is drinking, water is seen issuing from the artificial opening, whether that may be in the first, the second, or the third chamber; and if there be more than one artificial opening, one being in the third chamber, the water is seen issuing from this almost as soon as from the opening in the paunch. It is therefore proved that drink passes in part into the two first chambers as well as into the third and fourth, and that immediately in all the instances.

Reverting to the two facts, that coarse and bulky aliment passes exclusively into the two first chambers, and nothing but attenuated or fluid aliment into the two last, the causes appear to be easily explicable; for as the two last chambers communicate with the first exclusively through the inlet into the maniplies, an inlet naturally narrow, as all writers have remarked, and which besides, as M. Flourens ascertained, in many living animals can become so completely contracted as to exclude every substance which is coarse or of a certain bulk.

It is not more difficult to explain why coarse and bulky food falls always directly into the two first chambers, while attenuated and fluid aliment passes immediately, in part at least, into the two last; for upon opening the paunch and the king's-hood of a living sheep, as was done by M. Flourens, and making it swallow different sorts of aliment, when this aliment is course or of a certain bulk it falls partly into the paunch and partly into the king's-hood; while, on the contrary, if the aliment swallowed be attenuated

* Element. Syst. of Physiology, ii. 462, 2d edit.

or liquid, it is seen passing immediately, at least in part, into the maniplies, and through the maniplies into the fourth chamber.

Upon examining what takes place in the gullet during the process of each swallowing, it is observed to be dilated by the aliment, and opening when the aliment is coarse and then the morsel is carried through the gullet directly into the paunch or into the king's-hood. On the contrary, when the aliment swallowed is thin or fluid, the gullet remains closed, and in that case the aliment takes the only way open to it, which is through the cud-duct into the maniplies, and thence into the fourth chamber, or, to speak more precisely, it follows the groove by which the cud-duct is prolonged into the gullet, forming in the corner of the latter a conduit always open even when the gullet is narrowed or quite shut; consequently this groove of the cud-duct is very inaccurately described by Daubenton as opening and shutting almost like the corners of the human mouth. one corner remaining shut while the other corner is open,* whereas it is never shut.—So surely, indeed, is the open or shut state of the gullet the cause of attenuated or fluid aliment, being carried along the cud-duct, that whenever even fluid aliment is too much accumulated, or is swallowed too quickly, or encloses a bubble of air, the gullet being dilated thereby opens, and the aliment falls into the two first chambers in the same way as coarser aliment.

There are then two distinct ways of swallowing the one by the gullet, the other by the cud-duct, and the aliment takes the one or the other of those ways according to its bulk and solidity, the open or shut state of the gullet determining into which chambers it can go. It is morcover the aliment itself which determines the opening or shutting of the gullet, as when coarse or bulky it opens the naturally shut gullet, and when attenuated or fluid it leaves the gullet shut and passes through the always open cud-duct.

Having thus ascertained the mode in which ruminating animals swallow their food, and the course it takes when swallowed, the next point of inquiry is the mode in which the aliment, after having been swallowed the first time, is returned into the mouth to be rechewed and swallowed the second time. The slightest observation is sufficient to show that the swallowed aliment is not brought up again into the mouth by simple vomiting similar to that of non-ruminant animals, for ruminant animals have not only the common organs of vomiting, but peculiar organs whose mechanism and operation shall be presently investigated.

It is agreed among all authors that the organs in question of ruminant animals are of two orders,—mediate such as the midriff (*diaphragma*) and the muscles of the abdomen; and immediate, such as the several chambers of the stomach; but there is considerable diversity of opinion as to the particular chamber which influences the process. According to Duverney, the paunch is the principal organ of communication, in which opinion Bourgelat, Chabert, and Toggia concur, while Daubenton, who is followed by Camper and most English physiologists, contends the king's-hood is the principal organ.

* Apud Rozier, Cours d'Agriculture, iii. 694.

It is obvious from the preceding experiments, that it must be one or both of the two first chambers which returns the food; and in order to ascertain whether this was accomplished by their own or by some exterior force, M. Flourens made the following experiments.

Upon laying bare the four chambers of the stomach in a living sheep, M. Floureus was astonished at the small degree of reciliary and contractile energy in their tissue. He successively tried all sorts of irritation, by pricking, incision, the actual cautery upon the membranes of each of the four chambers in several sheep, but he could not in this way discover either any partial contractions in the fibres immediately irritated, nor any general vermicular motion, however feeble. On the contrary, when the chambers, particularly the king's-hood and the paunch, are in their natural position, that is, under the combined influence of the midriff and the abdominal muscles, their contractile motion is very distinct, a motion which can be well observed by means of an artificial opening either in the paunch or in the king's-hood, they are both found to contract with considerable force during the efforts made to bring up the food into the mouth.

The paunch has already been more than once mentioned to be divided into several pouches, by projecting membranous partitions corresponding with furrows on the outside of the organ. Now, on introducing the finger into the paunch through an artificial opening, the sides, and more particularly the membranous partitions, are felt forcibly contracting, and forming as it were knots. Again, upon raising up the superficial envelope of the middle region of the abdomen, and leaving untouched only the transparent membrane (*aponeurosis*) which covers the paunch, the exterior of this chamber is perceived contracting, dilating, and almost incessantly exhibiting a great vermicular motion. It is therefore certain that the contractile motion of these chambers of the stomach is much greater in their natural position than when they are laid bare.

In order to ascertain whether rumination would take place without the aid of abdominal muscles, which all authors maintain to concur in the process, M. Flourens deprived these muscles of their power of action in a sheep, by cutting their two nerves, (*nerfs diaphragmatiques.*) The animal was immediately seized with a great wheezing, and the chest heaving with difficulty, breathing appeared to be carried on solely by the contractions of the deep-seated muscles of the belly. By degrees the wheezing diminished or disappeared; the animal began to eat, and next morning it ruminated but with difficulty, and with efforts affecting the abdominal muscles, which exhibited several successive contractions before the aliment could be brought up into the mouth. The cutting of these nerves, therefore, renders rumination more difficult without causing it to cease. It is to be recollected, however, that the cutting of these nerves does not stop the motions of the midriff, but only renders it more feeble. By other experiments M. Flourens proved, that when the action of the abdominal muscles is entirely stopt by dividing the spinal marrow, rumination ceases.

So much, then, for the organs which in ruminating as well as non-ruminating animals concur in ordinary vomiting; but the peculiar vomiting or bringing up the food into the mouth in the process of rumination is greatly different. The peculiarity in the case of rumination is, that the bringing up the food from the stomach is not a confused vomiting or belching as in non-ruminant animals, but a regular rejection of the aliment in detached portions. Daubenton, the first author that has given any distinct account of this peculiarity, which he says consists in the king's-hood contracting, detaching from the mass of aliment contained in it a portion thereof, forming this into a rounded pellet or *cud* (a corruption of the word "quid,") and moistening this to render its passage up to the mouth more easy. This account appears to be acquiesced in by Camper, by Blumenbach, and by most of our English writers. Dr. Bostock says, "From the second stomach the food is again brought up into the mouth in the form of a rounded ball."* On the other hand, this account is circumstantially rejected by other authors of note. M. Chabert says there is small ground for believing those who pretend that the king's-hood is destined to round and moisten the pellets to be carried up into the mouth.—M. Bourgelat again concludes, first, that the king's-hood does *not* detach from the mass of aliment contained in it the portion which is to be returned into the mouth; secondly, that it does *not* perform the office of rounding and moistening such portions, as these naturally take the form given them by the gullet, through which they pass, and consequently he denies the existence of rounded pellets. It will immediately appear that both of these theories are erroneous.

M. Flourens began his experiments on the points in question, by cutting out a portion of the king's-hood in a living sheep, and in order to diminish, as much as possible, the contractile action of the remaining portion, he fixed, by several points of nature the edges of this portion to the sides of the abdomen. Being thus deprived of one of its sides, while the other side was fixed so as to prevent almost any motion, it was evident the king's-hood could not contract itself into a rounded form, so as to prepare rounded pellets. Accordingly, therefore, if it be indispensable to rumination that pellets be formed, and if it be the king's-hood which forms these pellets, as Daubenton maintains, it would have been impossible for M. Flourens' sheep to ruminate; but it did ruminate, and that frequently, and hence it is proved that the king's-hood does not perform the office attributed to it by Daubenton; for admitting that pellets are formed, it is not the king's-hood that forms them. Daubenton, indeed, is the only author who mentions these pellets, and he had only seen them once by accident, for nothing of the kind is discoverable on opening the stomachs of ruminant animals. M. Flourens, finding that pellets, contrary to Bourgelat, were actually formed, resolved to trace them to their origin.

M. Flourens, in order to procure a pel-

* Element. Syst. of Physiology, ii. 449, 2d edit.

let, opened, by an incision made lengthways, the gullet of a sheep, towards the upper third of its passage along the neck, hoping that if the animal ruminated, the pellets, as they came up from the stomach, on arriving at the opening of the gullet, would fall out. The animal, however, did not ruminate, and lost almost incessantly a prodigious quantity of saliva through the upper end of the incision. It frequently sought to eat, and more particularly to drink, but all that it ate or drank immediately escaped through the upper end of the incision. After preserving it for three or four days in this state, he opened it, and found the paunch to contain no liquid whatever, all the materials in it being dry, and as it were kneaded into compact and separate masses in the several partitions of the chamber. What was more interesting, he found towards the spot where the paunch corresponds to the termination of the gullet, a pellet perfectly rounded, of about an inch in diameter, like the one seen by Daubenton. This pellet touched on one side the shut termination of the gullet, on another the mass of herbage contained in the anterior partition of the paunch, while the remaining portion of it was placed between the two margins of the cud-duct.—With respect to the king's-hood, it contained nothing whatever, either solid or liquid.

In another sheep. M. Flourens made an incision in the gullet similar to the preceding. It ceased to ruminate, and lost, as in the preceding experiment, a prodigious quantity of saliva. After preserving it for two days, he opened it, and found the materials contained in the paunch already dry, but not so much as in the first experiment. They were likewise divided into distinct compact masses, by the interior partition of the organ. The king's-hood was quite empty. With respect to the cud-duct, he found in it a pellet, not as in the first case completely formed, but beginning to be formed, and therefore showing more distinctly the mechanism of its formation. The half-formed pellet corresponded on one side to the shut termination of the gullet, and on the other to the shut inlet to the maniplies, while the rest of its surface was placed between the edges of the cud-duct. It was apparent from this, that the apparatus by which it was formed consisted on the one part of the shut termination of the gullet approaching the shut inlet of the maniplies, and on the other the cud-duct.

The gullet of a third sheep was operated upon in the same way as the two first, and this animal, contrary to what took place in the others, continued to ruminate. It ruminated, indeed, some hours after the operation; and M. Flourens perceived the pellets which ascended along the throat fall through the opening of the gullet, as he had anticipated, when he contrived the first experiment.—The pellets thus procured were moist and soft, but had not so perfect a round form as the firm dry pellet found in the first sheep. The pressure of the gullet had rendered them somewhat oblong and cylindrical, though it was obvious they had been previously round. From the morning of the operation, the animal ceased to ruminate, and during three or four days, which it was preserved, it ruminated no more. After this it was opened, when the paunch was found to contain nothing but dry materials moulded into distinct masses, and the king's-hood was completely empty, while the cud-duct contained a pellet dry and round, placed against the termination of the gullet, precisely as in the first sheep.

These experiments prove, that in the rejections of ruminating animals pellets are formed; that these are rounded; and that it is the cud-duct, together with the shut termination of the gullet approached to the shut inlet of the maniplies, which forms the pellets.

In order to form a distinct idea of the mechanism by which the pellets are moulded, it will be necessary to recollect, first, that the cud-duct extends from the termination of the gullet to the inlet of the maniplies; secondly, that when it contracts, it approaches one or other of these apertures; thirdly, that of these two apertures, the termination of the gullet is habitually shut, and the inlet of the maniplies naturally strait, can be so narrowed as almost to close by its own contraction; and fourthly, that when the two first chambers, compressed by the abdominal muscles and the midriff, contract, they push in consequence the materials which they contain both against the two apertures opposite to each other, and against the cud-duct opposite to the two chambers. The two chambers, in this manner, in proportion as they contract, push the materials contained in them between the margins of the cud-duct, and the cud-duct also contracting, causes the two apertures of the gullet and of the maniplies to approach, while the two apertures being closed and brought near together, seize upon a portion of the aliment and detach it in the form a pellet. The aperture of the gullet is closed during the act of detaching the pellet, because at that instant the midriff is contracted, and it only opens when the midriff is relaxed; and the aperture of the maniplies is closed, because at that instant the maniplies, as well as the other chambers, is contracted.

From these circumstances, it is obvious that the pellet must be detached, as it could not otherwise be seized by the two approaching apertures; that the pellet must be round, for this is the form of the cavity formed by the parts of the organs employed in the process; and that the pellet must be about an inch in diameter, for the cud-duct, when contracted in the act of forming the pellet, is about an inch in diameter.

There results from these experiments of M. Flourens another important fact respecting the digestion of ruminant animals.—Baron Cuvier long ago showed that the salivary apparatus was unusually developed in such animals, and the experiments just detailed show how copiously the saliva flows along the gullet into the stomach, and when it escaped by the incisions, that the food in the paunch became dry, hard, and compact, the chambers becoming deprived of all liquid. Even, indeed, when a pellet has been properly moulded, as without moisture it cannot ascend the gullet, it remains placed against the aperture of the gullet. In ordinary cases, no pellet is found on opening a ruminant animal after death, for the instant they are formed, they ascend the gullet into the mouth.

To secure, as far as possible, the moistening of the pellets in rumination, there is a remarkable provision in the structure of the king's-hood or second chamber. When much contracted, Daubenton says its cavity is not more than an inch in diameter, and much altered in appearance. "I have seen," he says, "the interior of this organ without recognizing it, as instead of a network of large meshes, they were only small sinuosities irregularly directed, upon examining which I found them to be deep, and containing fluid. While I was making these observations, the kings-hood relaxed from its shrunken state, the sinuosities enlarged, and took, under my eye, the figure of the meshes of a net such as we have seen them in this organ, when it is not contracted. Then the fluid disappeared, but I squeezed the meshes to make them take their previous form, and at that instant I perceived fluid ooze out and even run. I repeated this compression, and the fluid reappeared each time: it was contained in the thicknes of the organ as in a sponge."* M. Flourens adds, that when the kings-hood contracts, the projecting membranes of the polygonal meshes are brought close together, and form hollow cells or small tubes, transforming the whole interior into a sort of sponge, into the interstices of which the copious fluids usually contained in this chamber are squeezed at the instant of contraction, and not returned to the mouth for rumination along with the pellet.

It is apparently owing in part to this structure, that ruminating animals can subsist longer than non-ruminant animals without drinking. Goats and deer, for example, drink very little, and not to mention the camel and dromedary, whose stomachs are still more adapted to retain fluids. M. Daubenton proved by experiment that sheep could stand the want of water for a long time, and that they would live without drinking on chaff and hay. The French shepherds all agreed in telling him, that it was not necessary for sheep to drink every day, but they disagreed as to the number of days which could be passed with impunity without water. "After so many proofs," he concludes "of different kinds, it cannot be doubted that a great deal of water taken as drink, with moist herbage, or other watery food, is injurious to the health of sheep and the cause of most of their disorders. The effects of this may be recognised in hydatids or vesicles full of water, which are so very common in sheep. These adhere to the vecera, and I have frequently found them in the middle of the brain, where they enlarge so much as to compress and reduce it to a small volume. I have seen them fill three-fourths of the cavity of the skull, and prove fatal after the animal had languished for a very long time. These hydatids sometimes pierce the skin and stick amongst the flocks of the wool. In order to fill these vesicles, the fluid portion (*serosite*) of the blood must be so abundant, and must

* Rozier, Cours d'Agriculture, iii. 693.

escape from the blood-vessels so as to form deposites both within and without the body. Sweat is also a production of the fluid portion (*serosite*) of the blood, and hence is more to be dreaded in raminating animals than in others, inasmuch as sweating greatly diminishes the fluid, which ought to be employed in rumination. If sheep are sweating while they ruminate, therefore, there will be two evacuations of fluid at the same time, the body will be dried, and the blood exhausten and heated by the loss, while thirst will supervene so as to make them drink till they are incommoded, and their temperament altered. Sweating is also hurtful to sheep in other respects; for the fibres of their wool are thereby deprived of a part of their nourishment, which the sweat carries out of the body, while the heat which occasions the sweat causes the wool to grow too rapidly to acquire sufficient consistence. Yet we (in France) lodge our sheep in stables, where they sweat not only in summer but also in winter, and by ill-managed care and at an expense useless as well as hurtful, we affect their health and deteriorate their wool."*

It is obvious that on the same principles, the proper feeding of cows to produce the greatest quantity of milk must be regulated. If they are fed, accordingly, on very dry food, such as hay, the greater portion of fluids in the blood will be spent in the process of rumination and digestion, and the milk will be scanty; whereas, when the aliment abounds in liquid, such as mangel wurtzel or brewer's grains, and distiller's wash as in Holland, they will ruminate much less, a less quantity of saliva will be wanted for chewing the cud, and a large proportion will go to the production of milk though this will be thinner and not so rich in cream as the milk produced from drier food. It is to be questioned, indeed, by inference from experiments of M. Flourens, whether cows fed wholly on distiller's wash would ruminate at all any more than calves which so long as they suck never ruminate.

It thus appears, that a correct knowledge of the process of rumination, though a practical farmer might, at first sight, look upon it merely as a speculative curiosity, may lead to many important facts connected with the health and the diseases of sheep and cattle. Many other practical deductions and remarks might have been here added, but these would extend this paper much beyond our limits, and already more than enough has been stated to show the interesting nature of the process of rumination.

* Rozier, ut supra.

We give the following "Notes on Indiana," believing that they will be found highly interesting to many of our readers.

From the Springfield Ohio Pioneer.

NOTES ON INDIANA.

MR. EDITOR,—Having recently returned from a visit through the Northern part of Indiana, and thinking that a few hurried remarks upon that country might not prove uninteresting to some of your readers, I submit the following particulars.

After having made a voyage across the ocean of swamps, extending in width from St. Mary's, Ohio, to Fort Wayne, a distance of sixty miles, we reached the latter place, the country seat of Allen county, Indiana, situated on the east bank of the Maumee river, where the river is formed by the junction of the Little St. Joseph's and St. Mary's rivers, and immediately on the ground where Wayne's fortification against the Indians stood, from whence it derived its name. The population is about 1000: half of which are French and Canadians. The public buildings are a court-house, jail, and three churches: it has a bank and a library. The land office is kept here. The river is navigable for barges and keel boats; and lately a small steamboat ascended as high up as this place; and from this may be dated a new era of its prosperity. The Wabash and Erie canal passes through this place: twenty-five miles of it is furnished from here to Huntington, and affords an extensive water power at this place. In short, Fort Wayne is situated in the midst of a rich and fertile country, which, together with its other local advantages, must make it in a few years become a thriving and populous city.

After crossing the rich and fertile counties of Noble and Elkhart, with their many advantages, in a North Western direction, we came into the county of St. Joseph.—South Bend, the county seat, is beautifully situated on the south bank of the Great St. Joseph's river, upon a sandy plain elevated about 25 or 30 feet above high water mark; and contains a population of about 1000; and perhaps is not excelled by any town in the North for beauty of situation. It has attained its present importance and beauty by its superior local advantages. Its growth though rapid, has been steady, and corresponding with the improvement of the surrounding country. The town plat was laid off into lots, and brought into market between five and six years ago: a more eligible site could not have been found in all Northern Indiana. Travellers are charmed with its beauty, and upon learning its superior local advantages are at once struck with the conviction, that it must and will, in a very short period of years, become a town of some five or ten thousand inhabitants. The St. Joseph's river, opposite the town, is about two hundred yards in width: it is a deep and majestic stream, and is navigable for steamboats as far up as South Bend, and even further, except when locked up by the frosts of winter. Its course is generally North-West, and a more beautiful and imposing stream was never gazed upon by man. Just opposite the town there is a fine fall in the river, which when properly improved will afford a most tremendous water power. A company of enterprising men are now improving it by cutting a race with a lock for boats to pass through, and furnishing materials for damming the river. It is calculated that a power will be brought under control sufficient to propel from fifty to a hundred run of mill stones. This vast power will be immediately thrown into market: it will immediately arrest the attention of enterprising capitalists, and will, without doubt, all be employed in propelling various kinds of machinery in a very few years. Besides this vast power, there is a race discharging the waters of the Kankakee river into the St Joseph's on the town plat, affording a volume of water sufficient to propel from ten to twenty run of mill stones. There may be some estimate of the power afforded by this improvement when it is made known that the proprietors have been offered the sum of thirty thousand dollars: the whole improvement perhaps not costing more than three thousand dollars. And here are the waters of the South united with the North—the Lankakee river emptying into the Illinois river, and the St. Joseph discharging its waters into the Michigan lake. Thus water, that was intended by nature to flow into the Gulf of Mexico is, by a little labor, made to flow into the Gulf of the St. Lawrence.

A canal is located through South Bend from Michigan city on Lake Michigan, to intersect the Wabash and Erie canal at Fort Wayne; and it will in all probability be put under contract the ensuing summer. The Michigan road—a graded road—extending from Madison, on the Ohio river, to Michigan city, passes through South Bend. This, it will be readily seen, is an important road; it being the greatest thoroughfare through the centre of the State, from South to North; and towns through which it passes in the interior may boast of it as being a matter of no minor importance. At no distant day, a railroad perhaps from some point on Lake Erie, directly through South Bend, to Michigan city, and thence, in course of time, west to the Mississippi river will be constructed. The project is under way, and the combined enterprise and capital east and west will be enlisted for its prosecution. By reference to maps it will be seen that this railroad must pass directly through South Bend.

The Kankakee river may, with trifling expense, be rendered navigable for steamboats within twelve miles of South Bend. A canal across these twelve miles, will open to South Bend a water communication with the great Mississippi river, and its vast and extensive commerce.

The town is remarkably healthy, and the land of the country around it, is like most of the land in the northern part of the State—open oak and some heavily timbered land, prairies, and low lands.

The soil is of a sandy nature, but mixed with a sufficient quantity of marl and iron, which renders it productive, and is a guaranty of its durability.

The county of St. Josephs, though but six years ago an untamed wilderness, the undisputed wild and uncultivated home of the savage, now contains a population of from five to six thousand enlightened and industrious farmers, and abounds with numerous well tilled, extensive, and productive farms. Possessing such advantages, it is not a matter of wonder that South Bend should have assumed her place among the populous and flourishing towns of the North. It contains two churches, a printing press, from which issues weekly the "South Bend Free Press," a public library, fifteen dry goods stores, and two drug stores; three taverns and four groceries; four lawyers, three physicians, and mechanics of almost all the

branches of the mechanic arts; there are, also several week day schools, two sabbath schools, a temperance society, and a lyceum, &c. &c.

About four miles from South Bend up the river, on the same side, is a village by the name of Mishawaka, containing a population of about three hundred souls. It possesses many advantages, and among others, inexhaustible beds of iron ore near it, which is going to be worked by a company of enterprising capitalists, during the ensuing spring. They are making hasty arrangements for a furnace, rolling mill, &c., and they have already in operation an extensive iron foundry, a flouring mill, and many other kinds of machinery. There are several large dry goods stores in this little village.

The next places that arrest the eye of the traveller, are Laporte and Michigan city, both of which are situated in Laporte county. The town of Laporte, the county seat, is situated near the centre of the county, on the south bank of a beautiful clear lake, of about a mile square; it is bounded on the east, south, and west, by extensive and beautiful dry prairies, and natural meadows, which are mostly all fenced and under cultivation, and dotted over with farm houses. On the south-west, the scenery is beautiful in the extreme, there being no forest or in exceptance of the view, till the horizon and the earth seem to close. Nothing can be more charming than a view of this in autumn, when the sun is declining in the west with all the splendor of an autumn afternoon. Laporte has a population of from five to seven hundred. Its public buildings are a court house, a jail, and two or three churches; it has also, a library and a printing press, from which is issued weekly the Laporte Herald. The land office for the Laporte district is kept at this place.

Michigan city is twelve miles from Laporte, and situated on the shore of Lake Michigan, from whence it derived its name. The ground upon which it stands, is very sandy, and uneven, consisting of hills of loose, yellow sand, which was at one day all occupied or covered by the lake water, but the waves have through time thrown up these sandy barriers and caused the Lake to recede for several hundred yards. The population is perhaps about a thousand, who are mostly emigrants from the State of New-York. Its advantages consist entirely in its being a landing place for vessels of merchandise for the interior part of the State. There is no harbor as yet at this place, but the citizens are making arrangements for constructing one the ensuing summer. The country immediately around is mostly broken, and of a poor sandy soil, covered mostly with white pine timber, which affords excellent building timber. It is not more than three or four years since this place was laid out. Its growth has been very rapid, and bids fair to become one of the foremost of the towns on the lake.

Much more might be said of the rapid growth and prosperity of Indiana; but having already lengthened this longer than I first intended for a newspaper arricle, it is sufficient to say that in a very few years Indiana will assume a place in the formost rank of her sister States. H.

From the Mechanic's Magazine.

INTRODUCTORY LECTURE,

To a course delivered before the General Society of Mechanics' and Tradesmen, by James Renwick, L. L. D., Professor of Natural Experimental Philosophy and Chemistry, in Columbia College, New-York.

In opening the first course of public Lectures which has been prepared for this Institution, I cannot but feel that my task is attended with some difficulty. Unable to forsee the wants and wishes of an audience now for the first time assembled, I have been in doubt whether it would be best to adopt a strictly scientific, or a merely popular plan, or whether a middle course might not be preferable, in which the dry discussions of pure science should be relieved by illustrations of a more familiar character.

There has also, been a question whether the few lectures ought not to be devoted solely to such subjects as might possess the charm of novelty, and thus illustrate no more than the recent additions which have been made to philosophic knowledge, or whether they should embrace matters more familiarly known.

It has, after due deliberation, been inferred that this audience has not been collected merely for the purpose of learning what has recently been done in science, but would prefer to receive a connected view of the subjects which may be treated of; in which way, while mere novelties will not be wholly excluded, they will occupy no more space than their real importance entitles them to demand. It often happens that a new discovery attracts for a season an undue portion of attention, and different subjects have thus, in rotation, filled up a measure of the time devoted to the study of science, far beyond that which is due to their intrinsic merits, or their value in practical application. Thus, common electricity for several years demanded nearly half the time which was devoted to the physical sciences; it was then superceded by galvanic electricity; while at the present moment electro-magnetism and the polarity of light, are the fashion. Without pretending to undervalue either of these branches of knowledge, it is sufficient to say that they have not been considered of sufficient practical value to be introduced in the opening course of such an Institution as that at whose request, I have the honor to address you.

In determining, then, to have reference rather to the real importance of the subjects to be treated of, than any temporary interest they may have assumed from novelty or fashion, two distinct modes of proceeding have presented themselves. It might, in the first place, have been attempted to compress, within the prescribed limits of the lectures, a brief and general view of the whole extent of physical science. Such brief and general view might not be without its interest, but it would necessarily have been condensed within a space so confined as to render it extremely difficult to give to such of my hearers, as may not have had the benefit of a previous acquaintance, with at least, a part of the subject, any clear and satisfactory idea of the whole. This plan would also have labored under the disadvantage of excluding in a great measure, all experimental illustration.

In the second place, it is easy to select from the variety of matter included under the general head of physical science, a few subjects of important practical value. Each of these would then admit of being fully investigated, and full space would be allowed for rendering them interesting by experiment and apparatus.

The latter has, for such reasons, been considered the preferable plan, and this view of the subject has received the sanction of the very intelligent committee of the Institution.

In respect to the style, which it would be most expedient to adopt, I have, upon my own responsibility determined on framing the lectures in a plain and didactic form, rather than attempt to dress them in literary ornaments. For the subsequent evenings of the course, the reading of written lectures will be avoided as far as will be consistent with a clear and perspicuous exhibition of principles. Conceiving that it is probable, that, at least a part of the audience, has had no opportunity heretofore of iustruction in physical science, and is therefore assembled for the purpose of acquiring elementary knowledge, the mode which experience has shown to be best adapted to that particular object will be pursued. To those of my auditors who have already made proficiency in such studies, this must serve as an apology, for bringing before them matters to which they are familiar. Still, even to them, it may not be uninteresting, to review what they have long since acquired; and to fortify their recollections by witnessing again facts and illustrations, which, however often repeated, cannot wholly cease to be worthy of attention.

If such impressions be not erroneous; to define the limits of the sciences which fall within the scope of my studies, and to point out what parts of them have been selected as the subjects of the present course, will form no unfitting introduction.

The physical sciences present a wide and

extensive field. More than two centuries have elapsed since the proper mode of studying them was revived, and the few sound principles with which the ancients were acquainted, restored to their proper rank in the scale of human knowledge. From the time of this revival up to the present hour, no year, and indeed hardly a month, a week, or even a day, has elapsed, which has not added to the present stock of facts. From these facts, general principles and laws have been continually deduced, until the science of natural philosophy, which was at first of so little extent as to permit of its being successfully cultivated in connection with others, has been necessarily divided into many distinct branches, each of which may well occupy the whole attention, even of the most powerful intellect.

Physical Science, or, in other words, Natural Philosophy, has for its object, the laws which govern the phenomena and appearances of the material world. Every thing, therefore, which is capable of perception by our senses, falls within its province, as well as all the agents which are efficient in influencing them, whether these agents be themselves objects of sensation, or known only by the effects they produce on the bodies which are.

The world with which we become acquainted by the evidence of our senses, and to which the name of material has been given, is made up of many substances extremely diverse in their specific characters, and yet agreeing in a few general properties, which enable us to class them all under one general term. This term is Matter.

In what the essence of matter may consist, we know not; nor is it probable that we shall ever learn, in this limited state of existence, the final causes by which it is separated, on the one hand from mere space, and on the other from spiritual existence. Metaphysicians have indeed with subtle ingenuity speculated upon these causes, until they have resolved matter into collections of mere occult qualities: while others have refined until they have denied its existence altogether. Such refinement of ingenuity appears almost ludicrous to the uninstructed mind, and it is not less repugnant to those who study physical science in the true spirit of philosophic inquiry. To those imbued with this spirit, or such as enter upon the study unbiassed, it is unnecessary to refute such sophistry. The error lies at the root of the inquiry; and it may be safely asserted, that, wherever metaphysical arguments are admitted into the discussions of natural philosophy, the chance of discovering truth will be in a great measure lost. It is from our senses, either unassisted, or aided by the instruments which the advance of science has both called for and supplied, that the whole basis of natural knowledge is to be derived, and it is to our senses that we must finally appeal to determine whether the inferences built upon that basis are correct or not.

In making the testimony of our senses the basis of all our knowledge of physical science, we proceed in one of two ways, namely: by observation, or experiment.

We are said to observe, when we watch for the phenomena as they occur in the regular course of events, and merely note the appearances which these phenomena present. We are said to experiment, when by means of apparatus or preparations, we cause actions to begin, which would not have occurred in the spontaneous order of nature; in this method of proceeding, we may not only induce an action, which might not have taken place without our intervention, but we may modify, and in some cases, cause it to cease; but we can do no more. The phenomenon itself is due to natural causes which are beyond our control, and escape our scrutiny. Hence experiment, after all, is no more than a case of the more general method of observation, the proper time for which, we may choose for ourselves, but whose result is independent of us.

These two methods cannot be adopted indiscriminately, nor is each applicable in every different instance. Thus, if we wish to examine the phenomena of the heavenly bodies, no other method is practicable but that of observation; their motions proceed in a space far beyond the limit of any of our senses except that of sight, and the several appearances which they present, occur at regular periods, but in a way which is beyond any control or modification on our part. Astronomy is therefore emphatically the science of observation. But when we wish to examine the internal constitution of bodies, we find the elements of which they are composed, united by forces which require the application of a more intense force of the same description, or of some powerful physical agent to overcome them. Such forces we can call to our aid, and such physical agents we can control and employ. Chemistry is therefore as emphatically the Science of Experiment. Other departments of Natural Philosophy may be investigated by mixed methods, in which observation and experiment, each fulfil their proper office.

It may perhaps be urged that the evidence of our senses is far from being infallible, and there is probably no person persent who may not, at some time or other, have been led into error, by relying upon this evidence alone. We have however the means of comparing and combining a number of different appearances, and of reasoning upon the basis of other phenomena, in relation to which no doubt can possibly exist, and we may in this way correct what would at first give rise to erroneous impressions, and actually deduce and demonstrate the true state of things, from the very perceptions which at first appear to contradict it. Thus, a savage or a child, who for the first time contemplates his own image in a mirror, may think this image the actual body of another person. By bringing the sense of feeling to the aid of that of sight, he will speedily learn the existence of the mirror, in what at first appeared an empty space, and careful observation will prove that the position of the image is dependent upon that of his own body, and follows his own motions; but if the appearance were to occur for the first time to one acquainted with the general laws of the reflection of light, he would be at once enabled to include the phenomenon of the image among the cases of that general problem. So also, our senses appear to inform us that the sun rises daily in the East, and performs his appointed course until he sets in the West, over the firm and apparently immoveable earth. So soon as his light has faded, innumerable stars show themselves which seem to be affected by a similar motion. But he who has made progress in physical science, can, by the very comparison of these apparent motions with each other, prove that they are all owing to the rotation of the planet of which we are ourselves inhabitants; which, so far from being of the importance that a comparison with our own pigmy stature leads us to beleive it, is a mere point in the vast system of the universe, and instead of being at rest is in a state of continual and rapid motion. The sun himself can be shown to be a million times and more, as large as our puny earth, and many of the stars, which to us seem mere luminous specks, to be even greater than that splendid luminary. Yet the whole of this knowledge rests for its basis upon the very facts, which to our first impressions, seem to demonstrate the reverse of the truths which are finally attained.

In order to understand how truth may be reached, even from contradictory appearances, it is expedient that we should treat in a brief manner of the mode of proceeding in physical science. This method is founded in nature, and is not only that by which philosophers proceed, when they pursue a proper mode of inquiry, but is that, by which children and the rudest individuals of our race, learn whatever is absolutely necessary to their safety and sustenance. As we advance in age, and in mental cultivation we are often tempted so deviate from the path which nature has pointed out, in the of pursuit more easy roads to truth; prompt-

ed partly by indolence, which induces us to endeavor to avoid the slow and laborious method, by which alone, true knowledge can be acquired, and partly by the influence of bad example. It therefore becomes necessary that rules for conducting the process should be laid down, and that we shall never be satisfied that our inferences are correct unless these rules have been rigidly adhered to.

The basis of all physical knowledge has been stated to lie in experiment, and the careful observation of facts. The truths thus obtained, so long as they are considered individually, are of value to direct our practice, only when the circumstances under which they were originally noted, recur without variation. It is not only necessary to record them, therefore, but to classify them; in order that phenomena, which are probably connected, either in their supposed cause, or in their appearances, may be considered together. Up to this time we use no scientific process, the record and classification of the facts, is purely historical, and has been said to constitute a department of that division of human knowledge, under the name of Natural History. This name, it may be incidentally stated, is now usually given to the description of the external characters of the bodies which we rank by their obvious qualities in the three great kingdoms of nature, the Mineral, the Vegetable, and the Animal. This department of knowledge has, however, been elevated, by the introduction of Philosophic reasoning, to the rank of a science, and we should, in speaking of it, give it its true value, by including its several branches under the denomination of "The Natural," as distinguished from the Physical Sciences.—When certain facts, obtained by observation or experiment have been classified, we are generally able to find among the phenomena which they present, one or more which are applicable to them all. A general proposition expressive of this agreement may then be deduced and applied to them without exception. Several such general propositions may be found to agree in some one or more points, and this agreement may be, therefore, expressed in a proposition of still more extensive application. Proceeding in this manner, from individual instances to general, and from general propositions to those still more general, we may finally, sometimes, reach propositions which include in their expression all substances on which experiment can be made, or which observation can reach. Such a proposition, unlimited in its application, is called a law of nature.

At other times we find the proposition to be limited in its application, to one or more classes or orders of natural bodies.

We are said, in thus obtaining general propositions from individual facts, to employ the process of induction.

It is, however, impossible to collect every individual instance, and thus obtain compiete proof of the general laws by induction alone. But we are warranted in concluding the truth of the proposition to be absolute, if we find it to apply to every case in which it is possible to make experiment or perform observation. We are now said to reason from analogy.

As an instance of the inductive process; of reasoning by analogy; and of the limit of some inductive propositions: I shall cite a very familiar case, drawn from Natural History, and partly connected with our most early impressions.

A child observes, that in his parents and play-fellows, the sensation of vision is operated by two concurring organs, and is not slow to become aware that he himself is similarly constituted. He finds the same provision existing in all the individuals of his race which he meets. He therefore infers, partly by induction, and partly by analogy, that "All men have two eyes." This is the first step in generalization, for until he had reached it, it would have been necessary for him to name the individuals in whom he observed the common fact.—He will probably have ascertained the truth of the same proposition, in respect to a variety of species of animals, but he cannot make the second step in generalization, until he have studied the elements of Natural History. He will then find that man, and all the animals in whom he has observed this peculiarity, belong to a grand division of the animal kingdom, which naturalists call the vertebrated, and will by two successive steps in the analysis—steps, we need not repeat here,—reach the most general proposition of all, namely: "*All vertebrated animals have two eyes.*" He cannot proceed farther, for he will find in other grand divisions of the animal kingdom, provisions totally distinct, or the faculty and organ wholly wanting; for, some animated beings have eyes innumerable, and others none. In reaching this most general proposition, he must have proceeded partly by analogy, and he can now apply the analogy to obtain even more extensive knowledge; for if he find, buried thousands of feet beneath the present surface of the earth, a fossil bone, although belonging to one of a family which has long since become extinct, he infers at once, that it, when living, had the same provision for receiving the impressions of light as existing vertebrated animals.

When a general proposition has once been obtained from individual instances by induction, we may, therefore, by analogy, make use of it to explain new facts, or to predict natural occurrences; we may also apply mathematical reasoning and calculation, and in either way may obtain propositions as certainly true as the result of the original induction itself.

We are now said to make use of theory; and although the term theoretic has been opposed to practical, as an epithet almost of reproach; it would were the individual to whom it is applied, worthy of it, be the highest possible praise; for it implies that he is acquainted with all known facts, as well as capable of applying them to discover new combinations, and to explain what has not before been observed.

What is styled hypothesis, is however, totally distinct from theory, and is liable to this reproach, for it is either founded on a partial view of facts, or has no other foundation, except that it is capable of explaining the phenomena which we observe.

In the course which I am now commencing, I shall find occasion to illustrate these modes of reasoning, and explain these processes further.

Physical Science is, then, built upon the foundation of innumerable experiments and observations, and is made up of propositions of different degrees of generalization. In the study of this science, it is by no means necessary to pursue in detail the methods by which it was originally formed. To enter into all the experiments, would occupy, not the duration of a single life, but of several; and some of the observations may be of phenomena so rare as to be repeated at intervals too distant to be seen oftener than once in the course of several generations. It is only necessary that we should have reliance on the veracity of the observer in the latter case, or have concurrent testimony in the former. Thus when Hally observed a comet in 1759, his observations were received to be true; others of a subsequent generation revised his calculations and predicted its return for 1835. Living astronomers therefore looked for it with complete faith. This faith was fully warranted by the exact coincidence of the re-appearance with the prediction. So also, to draw an instance from another source, when many nautical men have informed us that they have met, in the ocean, with an animal as large as a ship, we see no reason to doubt their joint evidence, and receive the existence of the whale for a truth as well established, as if it were derived from the evidence of our own eyes.

If, then, it be unnecessary for us to repeat the experiments and observations of others, provided the truth of their results be established by sufficient evidence: Of what use, may it be asked, is experiment in a course of lectures on the physical sciences? The answer to this question is important in the present instance, as it will elucidate the plan which it is proposed to pursue. Experiments, then, are of importance, and in some cases absolutely necessary, in a well conducted course of philosophical instruction: First, because they bring our analogical reasonings and mathematical investigations to the test of the phenomena themselves, and thus enable us to perceive whether we have included all the circumstances of the case: Secondly, because they enable us to illustrate general principles, by means of particular facts; and to describe the individual instances, whence the general laws are deduced; and, thirdly, because they impress upon the mind more firmly, the recollection of the principles which they are applied to illustrate. It is also to be stated, that they afford an agreeable variety, and thus render a study attractive, by giving pleasure to the senses, which, in their absence, might be dry and laborious.

Such, then, are the views with which experiment will be introduced into the present course. The manner in which the

general principles that will be developed were originally discovered, will be described in the way of history, and reference will be had to the distinguished philosophers, who have been authors of the several discoveries. To these we shall appeal as authorities, not however to follow with blind obedience, but with due regard to the evidence of the authenticity of their statements, and to corroborating facts. This authenticity we shall test in individual cases by experiment, and thus show the truth of the induction, by the exhibition of a few of the facts whence it was originally obtained; at other times, we shall have recourse to experiment, solely as an illustration of the principles laid down, or for the purpose of serving as an artificial memory.

For such experiments, liberal appropriation has been made, and it is hoped, that by proper exertions, the course may be rendered not only instructive, but interesting.

Having thus explained the method by which the principles of physical science are originally obtained, defined the value and use of experiment in a course of public lectures, let us return to the consideration of the class of existences, the examination of whose phenomena is the object of Natural Philosophy.

We have already seen the impossibility of lifting the veil which hides from us the agency of the Maker of "this universe and all created things," and of penetrating to the final causes which operate in the constitution of the substances and actions, which become known to us through the intervention of our senses. Failing in this, we adopt the method of defining the object of which physical science more especially treats, by its properties. Choosing for this purpose those, which by the method of induction, can be shown to be universal, and omitting every property which is not common to every part of the visible world.

The existences, then, which we include under the general name of matter, are marked by certain obvious properties which are common to them all. These essential properties are but two in number, and are known by the names of extension and impenetrability. By saying that matter possesses the property of extension, we merely mean, that it must occupy a portion of space in all the three dimensions of length, breadth and thickness. By impenetrability we express, that it is capable of occupying this portion of space, to the exclusion of all other material substances, or in other words, that no two portions of matter can exist in the same space, at the same instant of time.

From the fact that matter is extended, it follows that it is capable of being divided; and discussions have been entered into, for the purpose of examining how far this divisibility may be carried. It is sufficient for our purpose to state, that it is believed at present, upon a variety of concurring facts, that matter is by division finally resolvable into portions which are incapable of further division. This proposition is not however, susceptible of absolute proof, for the actual division, by mechanical, physical, or chemical means can be carried to such an extent, that the sight, even when aided by powerful instruments, can no longer follow the operation.

The ultimate portions into which it is believed that matter is finally resolved by division, are called atoms, or, in more familiar language, particles of matter. If it be true, that no two particles of matter can exist in the same space at the same time, it follows, that before any particle can enter and occupy the place possessed by another, the latter must be moved from that place. Mobility or the capability of being set in motion is therefore, although sometimes reckoned among the essential properties of matter, no more than a necessary consequence of its impenetrabity.

Attraction also, which is often classed among the properties of matter, is not essentially so, for we can conceive matter to exist without it, which is not the case with the other two properties which we have named.

When we cease to consider matter in the abstract, and view it as it presents itself to our senses, we find it existing under certain determinate forms, or in peculiar and well marked states of existence. To these determinate forms and peculiar states, we give the name of bodies.

Bodies, as we find them on the surface of the earth, are undergoing continual changes, although with different degrees of rapidity. Thus some small animals are born, enjoy the functions of life, and die, within a few hours; and no sooner has their life departed than a decomposition begins, which resolves them back again into inorganic matter. Other animals, and some productions of the vegetable kingdom, resist for centuries the attacks of death, but are finally made subject to the same general law. Even the most solid rocks yield gradually to the principle of change, and generations of them succeed each other in geological chronology, as those of men do in civil history.

In some cases, the disintegration is always attended by the destruction of the body, which the particles originally composed. Such is the case with all inorganic beings. But in the animal and vegetable kingdoms, although a waste of their particles is continually going on, this waste is supplied by the food which they consume, so long as the vital energy remains. In the youth of animals this supply exceeds the waste, and the body increases in bulk. In more advanced age, the waste and supply balance each other. Such is the extent of the change, which we are thus undergoing, that it has been proved by physiologists that at the end of seven years, no one particle which at the beginning of that period composed a part, even of our hardest bones, is left in the human body.

In all these changes, experiment and observation conducted with the nicest care, and strictest attention to weight and measure, have shown that not the smallest particle of matter is ever lost. It may be traced, forming in succession a portion of many different bodies, but in the innumerable changes of form, which proteus-like it undergoes, it still continues to exist, and to occupy its due extent of space, to the exclusion of all other material substances. The actions which we call natural, because they are due to causes inscrutable to us, operate with powerful, and in some cases, irresistible energy to produce changes in the constitution of bodies. We can ourselves, bring to operate on bodies mechanic forces, by which they may be rapidly disintegrated; and the actions of flame, of chemical affinity, and of other physical powers are still more efficaceous in changing the determinate forms in which matter exists at any given moment. But all these agents, natural, mechanical, physical or chemical, are wholly incapable of adding to, or diminishing in the least degree, the quantity of matter, which exists in the universe. Matter therefore, so far as any cause, which we can reach by our finite intelligence, is capable of acting upon it, is incapable of increase or diminution. It has therefore been inferred by some that it is eternal.

Persons of good intentions, but ignorant of physical science, have stigmatized the proposition of the indestructability of matter as Atheistic. So far, however, from being so, this very fact, is among the most powerful of the proofs of the existence of a deity, which natural theology brings to the aid of revealed religion. We cannot conceive of the existence of any thing without an adequate cause, and this truth is admitted under the name of the sufficient reason, both by infidels and believers. If then no finite cause be sufficient to generate material existence, it necessrily follows, that all which we see or discover by our other causes, in the universe, must be the work of an omnipotent cause,—the creation of an agent of infinite power. If his workmanship be eternal, so must he also be; and of his wisdom all nature furnishes abundant proof. If on the other hand the present state of things is ever to be brought to a close, it can only be so, by the same Almighty power, to which its original creation was owing.

The motion which bodies acquire, in consequence of the impenetrability of the matter of which they are composed, is subject to certain definite laws. The study of these, and the application of them to predict and explain natural phenomena, and to direct the works of human art, is the province of an extensive division of Physical Science, to which, from the intimate relation it bears to the practice of all the arts, the name of MECHANICS' has been applied.

Mechanics' differs from the other divisions of natural philosophy, in approaching more closely to the rank of an exact science. The laws which govern the action of the forces by which motion is produced are few; and are reached by the most simple induction. Upon these laws a science of vast extent and almost unlimited application, can be built by the aid of mathematical reasoning alone. So completely is the mode of proceeding identified with that employed in pure mathematics, that the original induction is often passed by unnoticed by such as content themselves with the mere theory. When, however, this theory is to be applied to practical purposes, innumerable experiments become necessary, upon friction, the strength of materials, the resistance of fluid media, and other interfering causes. Such however has been the extent of the researches into these subjects, and the accuracy of the mathematical laws which have been deduced from them, that it is hardly possible for a new case to occur in practice. We can calculate the power, and forsee the ac-

tion of a machine, determine the proper dimensions of the parts of a proposed structure, or predict the quantity of water which will be delivered by a pipe, although miles from the source may intervene, with almost as much precision as we can estimate the number of square feet in the floor of a room.

Situated, as we are, upon the surface of a body which we call the earth, our position causes us to draw a wide distinction between the bodies which we find in our own immediate vicinity, and those which our sight teaches us, to exist in distant parts of space. The appearnces of the latter bodies, to which we have given the name of heavenly, are pursued by a species of observations which we style Astronomic. To the astronomy of observation it is necessary to call in the aid of mathematical calculation; and we obtain by their union the science of Theoritu and practical astronomy, the most elevated of those included under the general name of Physical.

The laws which govern the motion of the heavenly bodies, are shown by this science to be identical with those which are involved in the motion of terrestial bodies. The motion of the ship upon the ocean, of the carriage upon the railroad, and of the manufacturing machine, are all subject to exactly the same rules as those which guide the planets through the regions of immeasurable space. When we apply these laws to the heavenly bodies, we create a science to which the name of celestial mechanics' has been given. This also goes in our language, although with little propriety, under the name of Physical Astronomy.

In the motions of bodies, in the changes which they undergo, and in some of their mutual actions upon each other, we perceive the influence of agents which cannot themselves be embodied or confined; and which therefore, although acting powerfully on matter, we cannot prove to be material. Among such agents are, heat, light, electricity, and magnetism. The investigations of the effects produced by them, and of the manner in which they act upon bodies, gives birth to a department of Natural Philosophy, to which the name of Physics is usually restricted.

The bodies which we meet with in nature are rarely simple in their constitution. Each of them is generally capable of being resolved into two or more other bodies of greater simplicity; and by means, whose manner of action we shall have occasion to study, bodies are finally reached, which it is impossible for us, in the present state of our knowledge, to simplify further. These simple bodies may again be re-united, and thus caused to regenerate the body whence they were originally obtained, provided it had not been organised. In the combinations which these elements thus enter into, they are found to be subject to a few determinate and definite laws. The study of these laws, and of the natures and characters of the substances themselves, is the province of another department of Natural Philosophy, which is known under the name of Chemistry.

Such then is the basis of the division of the general subject of Natural Philosophy, into distinct sciences. And it may not be amiss to repeat their names, along with a more brief definition, in order to impress them more fully upon the minds of such portion of the audience as has not yet entered upon the study of these subjects. The divisions of Physical Science, then, are:

1. Mechanics, which treats of motion in general, as well as of the construction of machines, and other artificial structures.

2. Astronomy, which observes the motions of the heavenly bodies, and by the application of mathematical calculation to the records of the observations, enables us to predict the occurrence of the several phenomena.

3. Celestial Mechanics, or Physical Astronomy, which applies the laws discovered in the motion of terrestrial matter, to the explanation of the phenomena of the heavenly bodies, and to the detection of minute variations, growing out of their mutual action, which can hardly be reached by observation alone.

4. Experimental Physics, which is generally restricted to the examination of the actions, and effects, of light, heat, electricity, and magnetism.

5. Chemistry which investigates the compositions of bodies and inquires into the nature and character of their elements, and of the several compounds which these elements make up. However different these subjects may be from each other, there is, notwithstanding, an intimate connection between them all, and it is indeed hardly possible to make progress in any one of them, without at least a partial acquaintance with each of the others. Nor is it practicable in almost any case, to produce a natural effect, in which actions which are included under at least three of the different heads, are not intimately connected. The three species of action which are thus closely allied, are the mechanical, the chemical and the physical. The agent, too, by which the motions of the heavenly bodies are controlled, is of the same general character as those we call physical; and were it not that we rather study it in its great mechanical effects, than in its mere laws, might be classed with electricity and magnetism.

A simple instance will serve to exhibit the connection, as well as to illustrate the difference, between these several kinds of action.

A smith places a piece of iron in his forge fire and heats it red hot; applying for the purpose the *physical* agency of heat. He next lays it upon his anvil and beats it into some proposed form, the action thus applied is strictly *mechanical*, not only in common, but also in scientific language. But while he beats the red hot metal, sparks fly off in all directions, which are the result of the combination of the iron with one of the component parts of the atmosphere, a combination which is therefore governed by *chemical* laws. We might go farther, and show how the combustion of fuel, urged by the action of a bellows, whence the heat is originally derived is due to another combination of mechanical, physical and chemical action, but what has been already said will suffice for our purpose.

It has already been stated that it is my intention to select from the wide field of which an outline has now been given, a few subjects susceptible of familiar explanation, and popular illustration. I have been farther guided in the choice of these subjects by the desire to exhibit those particular points in which Mechanics, Physics and Chemistry are more closely connected with each other. The course will commence with a general view of the classes into which bodies are divided, by means of their mechanical characters. Among these we shall find that the class to which the atmosphere which surrounds our earth belongs is the most curious and interesting. We shall therefore enter fully into the investigation of its nature, and mechanical properties. At every step we shall find that these properties are materially influenced, if not wholly due, to the physical agency of heat. The consideration of the effects of heat, and the laws by which it is governed, will therefore naturally follow.

Returning again to the atmosphere: its chemical character will be examined, and the manner in which it can be separated into a number of constituents, described. The most important properties of these constituents, and of the elements analogous to them in character will then be illustrated by experiment. In the course of these experiments, we shall be led to the consideration of the more important principles of physical science, and finally to the discovery of the laws of chemical affinity, with the consideration of which, the course will conclude.

It is hardly necessary that I should point out to this intelligent audience, the advantages to be reaped from the study of the physical sciences. Derived, as they are, from the careful observations of the action of nature, continued for several generations; and composed of laws and principles deduced by laborious study from innumerable facts, these sciences possess the merit of conveying to him, who wishes to enter into the practice of any of the useful arts, the accumulated experience of centuries. If therefore, it be not only possible, but a fact of daily occurrence, that a person, by practice alone may become eminent, in the manipulations of manufactures and the mechanic arts, he may save himself much labor, both of body and mind, by acquiring the principles of physical science, before he enters upon the manual part of his calling. These principles will enable him to foresee contingencies in the exercise of his art, which he might otherwise only learn by long and laborious experience. The difference in the progress of him who rests upon physical principles as the guide of his practice, and him who is unable to employ them, will be in some measure the same, as that which exists between the persons by whose researches the fabric of Natural Philosophy was erected, and those who study it in its present state. The investigations of the former have continued undisturbed, and in regular succession for more than two conturies, yet to a youth of intelligence and duly grounded in elementary knowledge, a couple of years may well suffice for the attainment of a complete outline of the sciences. The knowledge, too, which is acquired in the study of science, is capable of universal application, while that which is derived from practice alone, is of little value, except in the epecific case in which the experience was obtained. It is true indeed, that theoretic knowledge can never be a substitute for practi-